Federal Trade Commission

Complaint Against Lubrizol Corporation

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Volume I Summary Brief Assessment of Earnings Opportunies

CONFIDENTIAL

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SUMMARY OF THE REVISED, UPDATED (1993-2017) COMPLAINT TO THE FEDERAL TRADE COMMISSION AGAINST THE LUBRIZOL CORPORATION FOR ACTING TO CREATE A MONOPOLY THROUGH IMPROPER CONDUCT IN THE PETROLEUM FUEL ADDITIVE MARKET FOR COMBUSTION CHAMBER DEPOSIT (CCD), OCTANE REQUIREMENT INCREASE (ORI), AND OCTANE NUMBER REQUIRED (ONR) CONTROL, BASED ON OXIDATE-CORROSION INHIBITOR TECHNOLOGY.

COMPLAINANTS: THE NELSON FAMILY FOUNDERS, DURALT FUEL CONDITIONER INVENTORS, PATENT ASSIGNORS, AND POLAR MOLECULAR HOLDING CORPORATION, (POLAR HOLDING/PMHC) PARENT OF POLAR MOLECULAR CORPORATION (PMC).

Polar Molecular Holding Corporation (hereinafter “PMHC”) , and the Nelson founders/inventors, assert with documentary evidence, including a 2009 finding by the Federal Trade Commission cited herein, civil violations of federal trade law, (and other law), including, but not limited to the following legal claims, against the Lubrizol Corporation:

1. Violations of the Sherman Antitrust Act;
2. Monopolization;
3. Anti-competetive business practices;
4. Restraint of Trade;
5. Delay of market entry of a promising technology;
6. Product disparagement;
7. Tortious interference;
8. Patent infringement;
9. Conspiracy to Violate the U.S. Economic Espionage Act;
10. Conspiracy to bankrupt its competitors, PMC and PMHC (PMC’s parent company), and the Nelson Family Founders and inventors by undermining revenue-producing contracts and opportunities (consisting of over $27B net revenue from 1986 through the present date; and
11. Civil violations of the RICO Statutes. (A series of violations of law from 1986-2017 with damages accumulating every year as described herein, in the 1993 FTC Complaint, Exhibit # 7, and in the attached financial assessment by Dr. Frank Stafford).

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BACKGROUND:

The Nelson Founders/Inventors, Otis L. Nelson, Jr. and Mark L. Nelson developed the proprietary Duralt (FC) Fuel Conditioner Technology in the early 1980s. Duralt FC is 100% organic, non-metallic and is deemed “substantially similar” to gasoline, and is thus allowed for bulk treatment of U.S. Motor gasoline.

Duralt FC is unique in its ability to prevent carbon deposits from forming in the combustion chamber and it reduces the buildup of existing carbon deposits in the combustion chamber of gasoline engines. Combustion Chamber Deposits (CCD) give rise to Octane Requirement Increase (ORI) and increased Octane Number Required (ONR) in gasoline engines. ORI and increased ONR cause the car onboard knock sensor to retard spark timing, resulting in increased fuel consumption and increased emissions, and negatively affects engine performance and driveability. With Duralt FC present in gasoline motor fuels, spark timing is advanced thus improving fuel economy, reducing exhaust emissions, including CO2 (greenhouse gas) emissions, also improving engine performance and driveability of gasoline fueled automobiles. Duralt FC is the only organic, non-metallic additive that provides octane performance related benefits in gasoline engines, by reducing ORI, and ONR by 3 to 5 octane numbers. Specifically, 87 octane regular performs like 89 octane midgrade or 91 octane premium with Duralt FC in the gasoline.

Over the years these unique benefits of Duralt FC were validated and proven by auto/oil companies including the Ford Motor Company, Harley Davidson Motorcycle Company, Mercury Marine, Elf Aquitaine (later the combined Total Fina Elf, or TFE) a major French oil company, (4th largest in the world), the Society of Automotive Engineers (SAE), Scientists at Columbia University in NYC, and others.

(See attachments: (1). the Ford Motor Company verified claims for Duralt FC, (2) the Harley Davidson/Duralt FC flyer, (3) the Mercury Marine/Duralt FC flyer, (4) the TFE/PMC joint Market Agreement announcement, and (5) the SAE Technical Paper, # 890214, A Broad Spectrum, Non-Metallic Additive for Gasoline and Diesel Fuel: Performance In Gasoline Engines).

The Duralt FC invention was also the subject of numerous patents and trademarks/tradenames that issued in North America, South America, Europe, Africa and Asia. (6) (See Attached list of Patents and Trademarks)

HISTORY OF THE ATTACK BY LUBRIZOL ON DURALT FC, THE NELSON INVENTORS/PATENT DEVELOPERS/FOUNDERS OF PMC, AND POLAR HOLDING.

Lubrizol Strategy:

-Attack the technical credibility of Duralt FC despite tests/performance verification by TFE, Ford and other credible industry sources. (1993 FTC Complaint against Lubrizol by Mark L. Nelson co-founder, co-inventor, hereinafter the 1993 FTC Complaint) (Product disparagement, anti-competitive business practices).

-Undermine large business and Duralt FC revenue opportunites, & attack Polar public stock to weaken the Nelsons/the company. (1993 FTC Complaint) (Tortious interference, and securities fraud-manipulation).

- Conspire with its allies to take over the company/misappropriate the patents. (1993 FTC Complaint) (Proxy fraud, and bankruptcy fraud)

-Prevent access to the Duralt FC key oxidate component. (Monoplization, restraint of trade, anti-competitive business practices, tortious interference of contracts with the Alox Corporation, and Lockhart Chemicals).

-Delay Duralt FC market entry/exhaust the Nelsons/Duralt FC patents' life. (Delay of market entry of a promising technology, anti-competitive business practices, monopolization).

- Compete directly, and unfairly with the Nelsons/Duralt FC technology after tortiously interferring with revenue contracts and opportunities, thus financially devastating PMC, the Nelsons and PMHC. (Tortious interference, delay of market entry, anti-competitive business practices, monopolization).

-Create a monopoly in the multi-billion dollar oxidate-based CCD/ORI/ONR control fuel additive market. (Monopolization, anti-competitive business practices, restraint of trade, tortious interference of the contracts with Alox Corporation and Lockhart Chemicals).

Lubrizol's continuing illegal acts from 1986-2017, with accumulating lost annual revenues each year totaling $27 billion constitutes a violation of the civil RICO Statutes. Thus, no statute of limitations has run.

Starting in the mid 1980s Duralt came under intense attack by the Lubrizol Corporation, that was marketing a metallic, sodium based fuel additive trade-named Powershield. Powershield was being marketed as a "lead-substitute" for outdated gasoline engine technology on the theory that older spark ignition engines with soft valve seat metallurgy would experience excessive valve seat wear without the cushioning effects of lead oxides on the valve seats. Powershield, a metallic fuel additive, placed a sodium coating on valve seats (and also throughout the entire combustion chamber), thus reducing valve seat wear, or valve seat recession (VSR). Lubrizol, a New York Stock Exchange listed company at the time, represented to investors and the investor community that sales of Powershield would double their earnings per share. Thus the financial stakes were enormous for Lubrizol. The ends apparrently justified the improper conduct to create a monoply.

The problem was that Powershield, a metallic fuel additive, was not EPA approved for bulk treatment of unleaded gasoline, and increased CCD in gasoline engines exacerbating ORI and increased ONR. The new unleaded gasoline was typically two octane numbers lower per grade than leaded gasoline. Thus lower octane unleaded gasoline was the real problem being experienced, not VSR.Therefore Duralt FC was the

real solution to engine performance and durability, not POWERSHIELD. (In accelerated VSR tests Duralt FC actually did reduce VSR, but not by placing a deposit on the valve seat, or adding deposits throughout the entire combustion chamber, as Powershield did.).

Both Harley Davidson and Mercury Marine selected Duralt as a "lead substitute" over Powershield because of Duralt's ability to reduce CCD/ ORI and ONR. This was a setback to Lubrizol's market strategy to create a monopoly in the "lead substitute" market and Lubrizol then relentlessly attacked Duralt FC, the Nelson's and PMC for years, with product disparagement, tortuous interference of the Mercurcury Marine contract and other revenue producing opportunities, disruption of the presentation of the first Duralt FC technical paper #890214 A Broad Spectrum, Non-Metallic Additive for Gasoline, published by SAE, tortuous interference, stock manipulation*, a fraudulent takeover and fraudulent bankruptcy scheme** with Amway, and other illegal acts to create a monopoly in the "lead substitute" fuel additive market through improper means.

Lubrizol's illegal attacks on Duralt FC Technology in attempts to create a monopoly through improper conduct for Powershield as a "Lead Substitute" during lead-phaseout commenced in the mid-1980's were well documented in a 1993 Federal Trade Commision (FTC) Complaint Mark Nelson filed against Lubrizol and it's Allies.

(Exhibit # 7) (Attached see Summary, and exhibit list (Volume # 1) of the 1993 FTC Complaint Against Lubrizol by Mark L. Nelson).

Elf Aquitaine (Elf), a major French oil company, 5th largest in the world had tested Duralt for ORI control in 1988. Elf Research was attempting to find a CCD/ORI fuel additive to solve low octane related problems with the advent of unleaded gasoline in Western Europe. Unleaded gasoline was 2 octane numbers lower per grade than leaded. Dr. Gilbert Chapelet, Manager of Strategic Research at Elf, contibuted the successful test results for the first SAE Technical Paper on Duralt FC,"The Broad Spectrum Fuel Additive. Elf Research was unable to find any other effective CCD/ORI fuel additive. After publication of the SAE Paper, Lubrizol approached Dr. Chapelet to inquire about his findings on Duralt FC.

These sucessful tests resulted in a September 5, 1990, Option to License Agreement, and a June 30, 1991, Exclusive Distribution Agreement for sales of Elf High Tech racing fuel bulk blended with Duralt FC in the U.S. Market. This was the beginning of Elf and later Total Fina Elf's interest and commitment to commercialize Duralt FC in it's unleaded gasoline.

> *Footnote #1. As detailed in the 1993 FTC complaint, Lubrizol collaborated with the notorious short sellers, the Feschbachs (Stockbridge Partners) to drive PMC's stock price down from a high of $6.00 in early 1989, to under $1 in May 1990 (and the loss of PMC's Nasdaq listing) to create futher financial problems for the Nelsons and PMC, and assist Lubrizol in creating a monopoly in the "lead substitute" market through illegal/improper means. (see the evidence of Lubrizol's conspiracy with the Feschbachs against the Nelsons and PMC, and a related story in OTC Review, "Let the Sunshine In.")

On April 1, 1992 PMC, and Dow Chemical (a PMC licensee) met Elf in Paris, France and were provided additional successful ORI and CCD control tests conducted on Duralt FC at Elf Research, as part of the licensing agreement between PMC and Elf. Elf had one more test to run before commercializing Duralt FC in their motor gasoline in Western Europe, the 400 hour Renault 22700 test for CCD/ORI control.

(In attendance at the meeting was Dr. Brian Taylor a retired V.P. of Research at Chevron, was recommended by Amway to the Nelson's and PMC for employment. Amway and Lubrizol knew about the successful tests on Duralt FC, and the coming market launch of Duralt FC by Elf once the final test was completed).

(8) (See attached 1988 Elf ORI control test results on Duralt FC, (9) the September 5, 1990 PMC/Elf Option to License Agreement, the June 30,1991 Exclusive Distribution Agreement and (10) Page one and the General Conclusions page of the April 1, 1992 Confidential Report, A Summary of Engine Test Results from Elf to PMC and Dow. (11) the Freedonia Report on Petroleum Additives for June 30, 1992 discussing PMC and the January 1992 PMC, Dow Chemical Option to license Agreement).

By undermining Duralt marketing contracts, business opportunities, and revenues Lubrizol and it's Allies, including the Amway Corporation, set the stage for a fraudulent June 30, 1992 takeover of Michigan-based Polar Molecular Corporation (PMC) founded by the Nelsons.

The fraudulent proxy contest, take over was launched shortly after the meeting with Elf in Paris, in an attempt to prevent the successful launch of Duralt FC by a major oil company, and thus the commercial success of Duralt FC by the Nelsons and PMC. After the take over of PMC on June 30, 1992, Dr. Chapelet traveled to Saginaw, Michigan HDQ of PMC at the time, to confirm that the "front take over management"(including Dr. Brian Taylor) was going to honor the contracts with Elf. The response was negative, as relayed by Dr. Chapelet to Mark Nelson at the time. Despite the negative response, Dr. Chapelet performed the final test, the 400 hour Renault 22700 CCD/ORI test on Duralt FC resulting in highly positive test results.

After the fraudulent take over, the "front takeover management filed a fraudulent bankruptcy of PMC in complete contradiction of their Proxy Representations, in U.S. Bankruptcy Court in Boston in February1993, the purpose for which was the misappropriation of the Duralt FC patents and trademarks. These fradulent acts undermined licensing contracts for Duralt FC with Elf and the Dow Chemical Company, resulting in a major loss for the Nelsons and the stockholders of PMC. Thus Lubrizol created a monopoly in the "lead substitute" market through improper conduct. All of this is discussed in the 1993 FTC Complaint.

This was the first time Lubrizol and it's allies undermined Elf's, and later Total Fina Elf's commitment to commercialize Duralt FC in its unleaded gasoline, thus derailing this critically important market, and revenue opportunity for PMC, the Nelson founder/inventors, and Elf.

(Proxy (securities) Fraud, Bankruptcy Fraud, Tortious Interference, Anti-Competitive busines practices, Monopolization, Civil RICO).

The fraudulent bankruptcy scheme didn't turn out the way Lubrizol, Amway and their allies planned. First of all Mark Nelson and a small group of PMC stockholders presented evidence to the Court that the "front' takeover management was converting the Duralt FC intellectual property via a license without Court approval. The Court then removed the "front" takeover management, and appointed a Chapter 11 Trustee. After an investigation the Trustee sued the ejected "front" takeover management for proxy fraud in the takeover, and for bankruptcy fraud.**

Next, the 1993 FTC complaint by Mark L. Nelson against Lubrizol, and it's allies was filed and reviewed. Subsequently, the FTC advised the Trustee that if Lubrizol or it's allies attempted to buy PMC or the patents from the Bankruptcy Court, the FTC would sue them for violations of federal trade law. According to the Trustee's records, Lubrizol, Amway and others met with the Trustee to discuss purchasing the patents, but quickly retreated when advised of the warning from the FTC.

Due to the ejection of the "front" takeover management, the subsequent Trustee's lawsuit, the FTC Complaint and other legal strategies pursued, the Nelsons were able to recover PMC and the Duralt intellectual property in December 1994 through a Court approved Plan of Reorganization. However, the critical licensing agreements with Dow Chemical and Elf were lost as a result of the takeover-bankruptcy scheme. This delayed the Nelsons, PMC and Duralt FC market entry, costing billions of dollars of lost net revenues, and solidified Lubrizol's monopoly in the "lead substitute" market through improper conduct.

**Footnote # 2. (See Attached. United States Bankruptcy Court for the District of Massachusetts, Eastern Division. Chapter 11 Case # 93-10960-JNF. Stephen S. Gray Chapter 11 Trustee of the Estate of Polar Molecular Corporation v Charles C. Johnston, "et al").

On August 7,1995 Automotive News published a story entitled, "Gas Wars" in which Ford Motor Company and the American Automotive Manufacturers Association requested that the EPA require CCD/ORI control additives (unique to Duralt FC) in all U.S. motor gasoline. At Ford Motor's invitation, Mark Nelson was invited to the interview and Nelson detailed Duralt's CCD/ORI control benefits (verified by Ford) that met the EPA requirement the automakers were requesting from EPA.

(12) (Attached, see Gas Wars, Automotive News, August 7,1995).

Twelve months after recovering PMC and the Duralt FC patents from the U.S. Bankruptcy Court, on December 5, 1995, the Nelsons and PMC were able to persuade Elf, who were discouraged by the lost market launch opportunity in 1993, to enter into a Confidentiality Agreement to enable new discussions.

(13) (See attached December 5, 1995 Confidentiality Agreement between Elf Antar France and PMC, controlled by the Nelsons).

On May 23, 1996 a meeting was held by Elf and Mark Nelson (PMC President) at Elf Research Center in Solaize, France. At that meeting Elf provided Mark Nelson test results on Duralt FC, including the final 1992 400 hour Renault 22700 test Elf needed in 1992 to launch Duralt FC in their gasoline throughout Western Europe in 1993.

(14) (See attached partial of confidential test report provided by Elf to PMC (Mark Nelson), including the successful 400 hour Renault 22700 ORI/CCD control tests on Duralt FC needed to launch Duralt FC in Elf's gasoline in 1993).

In September, 1997 international investment banker, Salomon Smith Barney offered to assist PMC in acquiring Octel, a large producer of toxic, lead octane boosting additives for $950 million.

(15) (See attached September 1997 Salomon Smith Barney Book on the Octel Acquisition by PMC).

Duralt FC was to replace the octane boosting capabilities of lead (TEL) by reducing octane requirement of gasoline engines by 3 to 5 octane numbers. This was an environmentally sound and economical means of eliminating the negative human health and environmental effects of lead.

(See attached Technical Papers, (16) "Advanced Fuel Additive Technology for Cost Effective Gasoline Lead Phaseout by Control of Octane Requirement Increase; By Jerry R. Allsup, Polar Molecular Corporation. UN Special Session on Environment and Development, New York, NY June 1997. (17) SAE Technical Paper # 911739. Octane Requirement Increase Control-A New Way of Saving. Polar Molecular Corporation, by Mark L. Nelson, James E. Larson and Mark S. Carruthers. Automotive Industries In Expanding Countries, Buenos Aires, Argentina 3-6, 1991).

Two environmental organizations were involved in the effort to acquire Octel. The Alliance to End Childhood Lead Poisoning in Washington, DC, and the Conservation Law Foundation (CLF) in Boston. CLF was to assist in raising a $50 million private equity portion of the deal, and brought in on a pro-bono basis investment banker, Warburg Dillion Reid, to advise CLF. Warburg Dillion Reid unexpectedly discouraged CLF from assisting in the investment that was in line with it's business/environmental strategies, and thus undermined the needed equity financing.

(18) (See subsequent CLF brochure outlining it's strategy of effecting environmental improvement through profitable business deals).

Shortly thereafter, Warburg Dillion Reid introduced Lubrizol as an additive industry expert to CLF.

(19) (See attached communications between Warburg Dillion Reid, CLF, Lubrizol and Mark Nelson)

It is alleged that Lubrizol undermined CLF's interest in pursuing the Duralt FC "lead substitute" acquisition of Octel. Thus Lubrizol continued it's monopoly of the "lead substitute" market through improper conduct, and prevented the use of Duralt FC as a replacement for lead for oil companies still using lead octane boosting additives. The Octel acquistion would have established PMC as a major environmental additives supplier,with Duralt FC annual sales of more than $1 billion, and thus a major competitor to Lubrizol in the "lead Substitute"market.

(Tortious Interference, Monopolization, Anti-Competitive Business Practices, Delay of Market Entry, continuing Civil RICCO).

(Dr. Gilbert had been made aware of the proposed acquistion of Octel by PMC by Mark Nelson in a meeting in Paris, France, and stated that the resulting strong financial, and market position for PMC and the Nelson founder/inventors would result in a new agreement to commercialize Duralt FC with Elf, as Elf management would then be very comfortable with a renewed relationship with the Nelsons and PMC. This was the second time Lubrizol was able to undermine Elf's intention to commercialize Duralt FC).

On September 29, 1998 Mark Nelson and a team of industry experts made a presentation in Paris, France to Elf Antar France, proposing a Joint venture based on Duralt FC technology. The proposal was well received by Elf management, and futher discussions ensued.

(20) (See letter to Elf management setting up the meeting, and the presentation made to Elf by Mark Nelson and Duralt FC consulting experts, Alan Smith and Chandra Prakash).

On July 14,1999 Elf and PMC, led by Mark Nelson entered into a Memorandum of Understanding to develop a Joint Marketing Agreement between the two companies.

(21) (See attached July 14,1999 MOU between Elf and PMC).

At that time the Nelson founders/inventors and their company, PMC were obtaining the key Duralt FC additive component, an oxidate/corrosion inhibitor, Alox 400L, from the Alox Corporation in Niagra Falls, New York under an exclusive supply agreement, with licensing rights to the oxidate. Alox Corporation was owned by RPM Corporation, and was made aware of this important business development between PMC and Elf. Another company owned by RPM was Valvtech, a private label marketer of Lubrizol's Powershield. (Valvtech was a co-defendant in Mark Nelson's 1993 FTC Complaint against Lubrizol). After the signing of the MOU between Elf, and PMC, Valvtech assisted Lubrizol in acquiring Alox from RPM, and the acquisition was completed in late March, 2000 in violation of PMC's contractual rights with Alox Corporation. Lubrizol was intentionally pursuing a monopoly in the oxidate-based CCD/ORI/ONR control fuel additve business through improper conduct, and to shut off supply of the needed key oxidate component for Duralt FC.

(The loss of the supply by Alox of the Duralt FC key oxidate component was a major set back for concluding a new contract envisioned by the MOU with Elf by the Nelsons and PMC. Lubrizol's attacks on Duralt FC, the Nelsons and PMC were well known to Elf management, including Dr. Chapelet. This created significant uncertainty about the supply of Duralt FC to Elf.This was the third time Lubrizol undermined and delayed Elf's commitment to commercialize Duralt FC in it's unleaded gasoline).

(Tortious Interference, Monopolization, Restraint of Trade, Anti-Competitive Busines Practices, Civil RICO).

On March 3, 2000 Mark Nelson, PMC President confirmed a February 22, 2000, notice to Alox that PMC was extending the License Agreement for 5 additional years, pursuant to the Agreement provisions. On March 10, 2000, Alox advised PMC of a price increase for Alox 400L. On March 21, 2000 the Alox acquistion by Lubrizol was announced. This came as a complete surprise. "It was really out of the blue," said Patrick Weigel, President of the Alox Employees Independent Union. The Alox plant was scheduled for closing on April 30, 2001.

On December 08, 2000, Lubrizol sent an email to Mark Nelson, mentioning the acquistion of Alox in March 2000, that the oxidation equipment was in the process of being moved to Lubrizol's operations in Ohio at that time, and announcing that Lubrizol couldn't manufacture the quantity of Alox 400L-90 being projected by PMC/Nelson.

(Monoplization, Restraint of Trade, Anti-Competitive Business Practices, Tortious Interference, Civil RICO).

(22) (See attached June 21, 1990,10 year Licensing Agreement between Alox Corporation, and Polar Molecular Corporation, (executed by Mark Nelson). See letter August 1, 1997, to Alox V.P. Steve Miller from Mark Nelson expressing concerns about potential circumvention of Duralt FC patents and the ALOX-PMC License Agreement. The March 3, 2000, letter to Alox confirming the 5 year extension on the Licensing Agreement. The announcement by Alox on March 10, 2000 of a price increase on Alox 400L.The March 21, 2000, announcement of the Alox acquistion by Lubrizol discussed in COMTEX. The December 8, 2000, email from Lubrizol to Mark Nelson announcing the oxidation equipment was being moved to Ohio, and that Lubrizol couldn't supply PMC it's projections of needed Alox 400L-90).

(The projections of the Nelsons and PMC provided to Alox, and ultimately to Lubrizol included the anticipated new business opportunity with Elf. Moreover, the acquisition by Lubrizol of Alox created great uncertainty about the ability of the Nelsons and PMC to supply Dutalt FC to Elf. Thus Lubrizol deliberately undermined the upcoming business opportunity, and launch of Duralt FC by Elf for the fourth time).

(23) (See, The New Lube Report, May 30, 2012, "Lubrizol Sued Over Lockhart Acquisition." The early 2000 Alox acquistion by Lubrizol is referenced in the story and the lawsuit for monopolization against Lubrizol by Z Technologies).

In late 1999 Elf was merged with Total Fina, to become Total Fina Elf. (TFE).

After the merger of Total Fina and Elf to become Total Fina Elf (TFE), discussions were renewed with Mark Nelson/PMC and Alain Faure of Elf Antar France provided a letter on June 5, 2000, confirming Duralt FC CCD/ORI control benefits combined with Elf detergents.

(24) (See June 5, 2000, letter from Alain Faure of Elf Antar France).

On September 11, 2001, PMC entered into a Joint Marketing Agreement with TFE.

(25) (See attached PMC/TFE Market Agreement, (26) a 2002 minutes of meeting between TFE and Mark Nelson with forecasts of $40 million initial purchases of Duralt by TFE, and (27) a subsequent October 2002 public announcement of the TFE/PMC Market Agreement).

In December 2000, Lubrizol moved the operations of Alox to Ohio. Shortly thereafter, in 2001, Lubrizol sold a bad batch of Alox 400 L, the Duralt FC key component to PMC and it's contract manufacturer, Grow Automotive in Detroit, Michigan. The batch of Alox 400L was contaminated and unusable. Lubrizol refused to replace the bad batch, and forced PMC and the Nelsons to seek another supplier for it's key oxidate component. Lubrizol violated PMC's License Agreement signed with Alox, including exclusive rights to Alox 400L, in an attempt to create a monopoly through improper conduct in oxidates for CCD/ORI/ONR control fuel additives and refused to supply 400L to PMC with acceptable product quality control.

(These actions by Lubrizol also caused great uncertainty that the Nelsons and PMC could supply Elf with Duralt FC, the fifth time Lubrizol deliberately undermined the commitment of Elf, and now Total Fina Elf's commitment to launch Duralt FC in it's unleaded gasoline).

(Tortious Interference, Restraint of Trade, Monopolization, Anti-Competitive Business Practices, continuing Civil RICO).

The Nelson's identified Lockhart Chemicals as an alternate supplier for it's vital key oxidate component. After a joint technical effort Lockhart was able to produce an alternate oxidate to Alox 400 L. PMC received the exclusive right in a contract on August 8, 2001 to the alternate oxidate produced by Lockhart for Duralt FC. On October 23, 2002 Lockhart also entered into a contract with PMC to became the exclusive manufacturer for PMC's completed Duralt FC products.

(28) (See attached Lockhart/PMC contracts).

In September 2002, TFE, accompanied by Mark Nelson and PMC consultants, including Dr. Gilbert Chapelet made a presentation of highly positive CCD/ORI tests on Duralt FC plus TFE detergents in gasoline engines. Ford was the auto company supporter of Duralt

FC. At the conclusion of the presentation, Ford offered to assist the Nelsons, PMC, and TFE in efforts to obtain a regulation for Duralt FC (plus TFE detergents) from the California Air Resources Board (CARB), and the Environmental Protection Agency (EPA) requiring the bulk treatment of Duralt FC in all gasoline in order that the auto companies could meet fuel economy and emission standards required by regulation. Unfortunately the Nelsons, and PMC lacked the needed financial resources to proceed with this vital opportunity due to Lubrizol's illegal acts as detailed above in this Complaint. This circumstance also undermined the Commitment of TFE to commercialize Duralt FC in it's unleaded gasoline in Europe. This also represents the loss of a multi billion dollar opportunity to commercialize Duralt FC in the United States gasoline market, supported by the auto-makers.

In 2006, Lubrizol assisted Amway Corporation and some Amway distributors in producing a "knockoff" of a confidential, advanced Duralt FC formula from a confidential licensing file that was part of the Amway/PMC 1995 Licensing Agreement. The confidential, advanced Duralt FC formula, and confidential test results from Total Fina Elf Research, verifying CCD/ORI performance benefits of the formula were provided to Amway in 2005 by PMC and Mark Nelson, under the 1995 Amway Licensing Agreement. (The Licensing Agreement was part of a settlement for Amway's role in the Fradulent 1992 takeover of PMC, and the fraudulent 1993 bankruptcy scheme to misappropriate the Duralt FC patents. Amway failed to perform the Agreement costing the Nelsons and PMC millions of dollars in lost royalty income). Lubrizol provided the Alox oxidate for the "knockoff' of the confidential, advanced Duralt FC formula. Lubrizol was attempting to eliminate competition from the Nelsons and PMC in the oxidate-based CCD/ORI/ONR control fuel additive business, and to take over the business with Amway from the Nelsons, PMC and PMHC. Under the 1995 Licensing Agreement Amway was required to offer Duralt FC in all 80 country affiliates, a multi-million dollar opportunity.This opportunity was usurped by Lubrizol who tortuously interferred with the 1995 Amway Licensing Agreement, and Duralt was eliminated as a competitor to Lubrizol in the Amway world-wide "direct-seller" retail market, causing millions of dollars of damages to PMC, PMHC and the Nelson founders/inventors.

(TFE was well aware of the lost revenues from Amway, and the resultant financial problems, and in fact had made a highly credible technical and market presentation to Amway of very positive test results of Duralt FC plus TFE detergents in 2002, to encourage Amway to perform it's contractual obligations with the Nelsons and PMC. Once again Lubrizol's illegal acts undermined TFE's commitment to commercialize Duralt FC in it's unleaded gasoline, for the sixth time, as the Nelsons and PMC did not have sufficient financing to perform the joint Market Agreement executed on September 11,2001).

(Conspiracy to Violate the U.S. Economic Espionage Act, Tortious Interference, Monopolization, Ant-Competitive Business Practices, continuing Civil RICO).

(29) (See attached 1995 Amway-PMC Licensing Agreement)

In February 2007 Lubrizol acquired the oxidate business of Lockhart in an attempt to create a monopoly in the oxidate business through improper conduct, and also in the CCD/ORI,ONR control fuel additive market for oxidates used for Duralt FC. By acquiring Lockhart, Lubrizol was tortuously interferring with PMC, the Nelsons and PMHC exclusive right to the CCD/ORI/ONR control oxidate produced by Lockhart, and was also eliminating Lockhart as PMC's exclusive manufacturer.
(TFE was well aware of Lubrizol's acquistion of Lockhart, and the threat to the Nelsons and PMC's ability to supply Duralt FC to TFE, the seventh time Lubrizol undermined the commitment of TFE to comercialize Duralt FC in it's unleaded gasoline).

(Tortious Interference, Monopolization, Restraint of Trade, Anti-Competitive Business Practices, continuing Civil RICO).

In May 2007 PMC sued Amway, and it's co-conspirator distributors for the Duralt FC "knockoff" scheme. During discovery Lubrizol's role in the scheme was uncovered.

(30) (See attached Amway "et al" Complaint and (31) deposition testimony of R.Disberger, and S. Lehnardt revealing Lubrizol's involvement in the "knock-off" scheme).

In January 2008, PMC filed for Chapter Eleven Bankruptcy in the United States Bankruptcy Court in Denver, Colorado, to protect the Duralt FC Intellectual Property from a Amway instigated foreclosure scheme resulting from the financial devastation caused by Lubrizol's illegal attacks on Duralt FC revenue opportunities, including with TFE. This resulted in the eighth time Lubrizol's illegal acts on the Nelsons, PMC and PMHC undermined TFE's commitment to launch Duralt FC in it's unleaded gasoline.

In 2009 the FTC provided a settlement, ten year Consent Order for Lubrizol and Lockhart in which Lubrizol was forced to divest of the Lockhart acquistion which constituted a monoploy by Lubrizol in the oxidate business. (Proof of Monopolization).

(32) (Attached see the 2009 FTC Consent Order).

What the FTC didn't realize at the time was that Lubrizol had acquired Alox to deny access to the Duralt FC oxidate, Alox 400L, and thus tortuously interferred with PMC's exclusive right to it. The FTC also did not know that Lockhart was providing, under exclusive contract, the key oxidate component for Duralt FC to the Nelsons, Polar Holding and PMC, and was also manufacturing the finished Duralt FC products. By acquiring Lockhart Lubrizol was tortuously interferring with the contract with Lockhart, and attempting to prevent the Nelsons, PMHC and PMC from manufacturing Duralt FC, and was thus creating a monopoly through improper conduct in oxidates for CCD/ORI,ONR Control fuel additives with oxidate key components.

(Tortious Interference, Monopolization, Restraint of Trade, Anti-competitive Business Practices, continuing Civil RICO)

In June 2009 Mark Nelson made a presentation, supported by Total to CARB. After the presentation, CARB agreed to test Duralt FC in a large fleet of cars, and, if successful,

write a regulation for addition of Duralt FC to all unleaded gasoline sold commercially in California.

In July 2009, the Nelsons, PMC, and PMHC entered into a Memorandum of Understanding (MOU) to enter into a new formal joint Market Agreement to replace the 2001 Market Agreement that was due to expire in September 2009.. However a short time later PMC's Chapter 11 Bankruptcy case was converted to Chapter 7 on a motion by Amway collaborator defendents, represented by an Amway law firm, while the creditors were voting on PMC's Plan of Reorganization that paid creditors 100 percent of their claims. This was the ninth time Lubrizol's illegal acts undermined TFE's commitment to commercialize Duralt FC in their unleaded gasoline, (and eliminated the opportunity with CARB).

On September 15, 2009, a fraudulent auction was held of the Duralt FC patents by the Amway collaborator defendants, and the Amway law firm without a court order, after which the remaining, unexpired Duralt FC patents were abandoned in early 2010 through non-payment of maintenance fees and annuities..

In early 2011, Mark Nelson discovered a fuel additive on the Amway website trade-named XLP. The Material Saftey Data (MSDS) sheet identified an oxidate with a Lubrizol Cas number. Nelson called Lubrizol and asked the oxidate department for a sample of the named oxidate on the XLP MSDS sheet. The response was "how do you know about that".

Shortly after that XLP was taken off the Amway website, but then appeared on Amazon. If you google Amway fuel additive today, it takes you to Amazon where XLP is still marketed today.

Lubrizol is continuing its unlawful and improper conduct to present time to establish a monopoly for oxidate-based CCD/ORI/ONR control fuel additive technology, and to eliminate Duralt FC, the Nelsons, and Polar Holding as a competitor.

(33) (See attached XLP product on the Amazon website. (34) Also Amway Freedom Fuel Additive (FFA) on Amway's South Africa website. This name was used by Amway under the license of Duralt FC in the USA).

Lubrizol is obviously marketing the misappropriated Duralt FC formulas with the Alox oxidate to private label marketers including Amway, XLP and Valvtech in a continuing attempt to establish a monopoly through improper conduct for oxidate based CCD/ORI, ONR control fuel additives. To the extent that Amway, Valvtech, and others were Duralt FC customers this also constitutes tortuous interference,

Lubrizol is well aware that the latest Gasoline Direct Injection (GDI) engines are far more prone to performance problems caused by CCD and ORI than the older Port Fuel Injection (PDI) engines. The U.S. auto industry, under pressure to meet current fuel economy and (greenhouse gas) emission standards is rapidly implementing GDI engine technology in their production models (45% in 2015), and the GDI engines badly need

Duralt's CCD/ORI/ONR control benefits to maintain performance, fuel economy and emission standards.

In fact on May 13, 2014, Lubrizol presented a paper at the Israeli Fuels Seminar in Tel Aviv. On pages 115-221 Lubrizol presented technical data on the ability of "the Lubrizol Additive" demonstrating reduced Combustion Chamber Deposits (CCD) in Gasoline Direct Injection (GDI) engines. The "Lubrizol Additive" is Duralt FC technology with the Alox component as the key active ingredient.

After 8 years of litigation against Lubrizol co-conspirator, (the Amway Corporation) and some Amway collaborator defendents in efforts to preserve and protect the Duralt FC technology and intellectual property, the Nelsons, and Polar Holding restarted it's Duralt FC business, and market operations in 2015. A new manufacturer, TRU Custom Blends, Inc. in Flint, Michigan was engaged. TRU Custom Blends attempted to purchase Alox 400L/884 from Lubrizol for production of Duralt FC.

In a letter dated July 24, 2015, Lubrizol refused to provide Alox 400L/884. Lubrizol recommended TRU Custom Blends contact Lockhart, knowing this would limit the Nelson's, and Polar Holding's potential as a competitor to Lubrizol in the Duralt FC CCD/ORI,ONR control fuel additive market, and limit their potential as a "reliable supplier" to the oil industry.

(Monopolization, Restraint of Trade, Ant-Competitive Business Practices, continuing Civil RICO).

Meanwhile Lubrizol is providing this Duralt FC oxidate component to other companies such as Amway, XLP, Valvtech and others. This is restraint of trade, and a continuing attempt to limit/prevent competition to Lubrizol from the Nelsons and Polar Holding in the CCD/ORI/ONR control fuel additives market, thus creating a monopoly through improper conduct.

Now, after years of illegal acts against the Nelsons, PMC, and Polar Holding in attempts to undermine Duralt related business deals, exhaust the Nelson/Duralt patents' life, financially devastate the Nelsons, Polar Holding and PMC as competitors, and create a monopoly through improper conduct, Lubrizol will attempt to market Duralt FC CCD/ORI/ONR control fuel additive technology to the major oil companies, including very likely Total in France, posturing that PMHC, and the Nelsons are not "reliable Suppliers" due to the financial condition caused by Lubrizol's unlawful attacks. (PMC is now a Chapter 7 estate in U.S. Bankruptcy Court in Denver, CO.)

(PMHC, and the Nelsons entered into a Non-Disclosure Agreement (NDA) with Total Additives, and Total Research in November, 2015 in order for Total to update it's tests on Duralt FC, including in GDI engine technology, and diesel car engines, the "purpose"according to the NDA being the commercialization of Duralt FC in Total gasoline, diesel fuel, and detergent additive packages. The history of the relationship, and the new NDA demonstrates Elf/Total's continuous interest as a major oil company, in Duralt FC over 28 years, due to it's unique benefits including CCD/ORI/ONR control in

gasoline engines. All of the aforementioned acts by Lubrizol, including anticipated direct tortuous interference by Lubrizol of the new NDA with Total, will, if successful, constitute the tenth, and perhaps final, fatal time Lubrizol will have undermined Total's (TFE) commitment to commercialize Duralt FC in it's unleaded gasoline, thus eliminating Duralt FC, the Nelsons and PMHC as a competitor in the critical CCD/ORI/ONR control fuel additive market for the auto-oil industry).

(Tortious Interference, Monopolization, Anti-Competitive Business Practices, Restraint of Trade, continuing violation of the Civil RICO statutes).

(35) (See attached January 17, 2017, technical paper by Alan Smith, Polar Holding Automotive consultant on Duralt FC and carbon deposits in GDI Engines. (36) Also see SAE Paper by Chevron on CCD/ORI problems in GDI Engines).

CONCLUSIONS:

For over three decades Lubrizol has disparaged Duralt FC Technology which was invented and patented by the Nelsons, undermined the Duralt FC business opportunities, (including with Elf/Total), created by the Nelsons, PMC, and Polar Holding, financially devastating the Nelsons, Polar Holding and PMC as competitors, delayed Duralt FC market entry, and ran out the life of the Duralt FC patents to eliminate the Nelsons, PMC, and PMHCs exclusive right to the Duralt FC technology, among other illegal acts as discribed above. (Lost net revenues from Elf/Total alone are estimated, based sales to Elf and Total only, at about $13 billion from 1993-2017). Lost net revenues overall are estimated at $27 billion in the same time period. (See Report from Dr. Frank P. Stafford a noted economist, and Dr. Stafford's CV).

Lubrizol also wrongfully acquired both Alox Corporation and Lockhart to eliminate access, by the Nelsons, PMC, and PMHC, to it's essential oxidate component. Lubrizol and it's allies did all of this in an attempt to create and maintain through improper conduct a monopoly first in the "lead Substitute" fuel additive market, and then to create a monopoly through improper conduct in the vital oxidate-based CCD/ORI/ONR control fuel additive market for modern gasoline engine technology, including PFI and GDI Engines.

(Tortious Interference, Monopilization, Restraint of Trade, Anti-Competitive Business Practices, continuing Civil RICO).

The annual world market for the vital Duralt FC CCD/ORI/ONR control fuel additive technology for gasoline only is enormous, approximately $2.5 billion net revenue. The United States gasoline market alone is more than $1 billion USD net revenue, annually.

The world market (net revenue) for Duralt FC in gasoline is roughly the current size of Lubrizol's gross revenue and the profit margins would be far better than Lubrizol's current conservative, business model.

Accordingly, Lubrizol has gone to great lengths to misappropriate the proprietary Duralt FC CCD/ORI,ONR control technology, in order to create a monopoly for Lubrizol through improper conduct. Apparently, the legal risks Lubrizol has taken are commensurate with the potential rewards.

The world market for Duralt FC techology in diesel fuel is roughly double the gasoline world market, substantially increasing net revenue potential for Duralt FC, (misappropriated by Lubrizol through it's illegal acts).

Relief Sought:

The Nelsons and Polar Holding hereby request that the Federal Trade Commission investigate Lubrizol's predatory and illegal acts of monopolization through improper conduct, restraint of trade, anti-competive business practices, delay of market entry of a promising technology, tortious interference, and all of the other legal claims discussed herein, and take whatever legal actions are available under federal trade law, and other law to redress Lubrizol's illegal acts, and that of any co-conspirators of Lubrizol as appropriate.

Sincerely,

Mark L. Nelson, on behalf of the Nelson co-founders, co-inventors/patent assignors, and as Chairman, President, CEO of Polar Molecular Holding Corporation.

EXHIBIT LIST:

1). Ford Motor Verified Claims for Duralt FC,

2). Harley-Davidson/Duralt FC Flyer

3). The Murcury Marine/Duralt FC Flyer

4).The Total Fina Elf/Polar Molecular Corporation Joint Market Agreement Announcement.

5). The SAE Technical Paper on Duralt FC, #890214, A Broad Spectrum, Non-Metallic Additive for Gasoline and Diesel Fuel: Performance in Gasoline Engines.

6). List of Duralt FC Patents And Trademarks

7). 1993 FTC Complaint against Lubrizol, Summary and Exhibit List, by Mark L. Nelson

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Highlands Ranch, CO 80126

Polar Molecular Holding Corp.

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Email: PolarTech@Comcast.Net

Footnote # 1. Evidence that Lubrizol conspired with the Stockbridge Partners to short and drive down PMC's stock price from $6:00 per share of Common to $.90. OTC Review story, "Let The Sunshine In", sheds light.

8). 1988 Elf ORI Control Test Results on Duralt FC.

9). PMC/Elf Option to License Agreement September 5, 1990/ Exclusive Distribution Agreement for Elf Racing Fuel Plus Duralt FC, June 30, 1991.

10). Confidential Report, A Summary of Engine Test Results from Elf to PMC/Dow Chemical Company, April 1, 1992. (Paris, France).

11). The Freedonia Report, On Petroleum Additives, June 30, 1992.

Footnote # 2. United States Bankruptcy Court for the District of Massachusetts, Eastern Division, Chapter 11 Case # 93-10960-JNF. Stephen S. Gray Chapter 11 Trustee of the Estate of Polar Molecular Corporation v Charles C. Johnston, "et al".

12). "Gas Wars", Automotive News, August 7, 1995.

13). Confidentiality Agreement, Elf Antar France/PMC, December 5, 1995.

14). May 23, 1996 Confidential (partial) Test Report, Elf to PMC with Final Test Result needed to launch Duralt FC in Elf's gasoline in 1993.

15). 1997 Salomon Smith Barney book for Octel Acquistion by PMC for $950 Million.

16). Technical Paper on Duralt FC. "Advanced Fuel Additive Technology for Cost Effective Gasoline Lead Phaseout by Control of Octane Requirement Increase. By Jerry R. Allsup, Polar Molecular Corporation. UN Special Session on Environment and Development, New York, New York June 1997.

17). SAE Technical Paper #911739. (Duralt FC). Octane Requirement Increase Control-A New Way of Saving. Polar Molecular Corporation, by Mark L. Nelson, James E. Larson, and Mark S. Carruthers. Automotive Industries In Expanding Countries, Buenos Aires, Argentina 3-6 1991.

18). CLF Brochure. (PMC/Duralt FC) Environmental Improvement through profitable Business Enterprises.

19). Communications/Warburg Dillon Reid, CLF, Lubrizol, and Mark Nelson.

20). Letter from Mark Nelson to Elf setting meeting. Presentation for J.V. made by Nelson, Smith and Prakash to Elf Antar France made on September 29, 1998, Paris France.

21). Joint Marketing Agreement (MOU) between Elf Antar France and PMC. July 14, 1999'

22). (A). Alox/PMC Licensing Agreement (Alox 400L), June 21, 1990. (B). August 1, 1997 letter from Mark Nelson to Alox expressing concerns about potential Duralt patent infringement, circumvention of Licensing Agreement. (C). March 3, 2000 letter from Mark Nelson to Alox confirming 5 Year Extenstion of License Agreement. (D). Alox letter of March 10, 2000 to PMC announcing price increase. (E). March 21, 2000 announcement of Lubrizol Acquistion of Alox Corp discussed in COMTEX. (F). December 8, 2000 email from Lubrizol to Mark Nelson announcing the oxidation equipment was being moved to Ohio, and that Lubrizol couldn't supply PMC projections of needed Alox 400L-90.

23). The New Lube Report, May 30, 2012, "Lubrizol Sued Over Lockhart Acquisition".The earlier 2000 Alox Acquisition by Lubrizol is referenced in the story and the lawsuit for Monopolization against Lubrizol by Z Technologies.

24). Letter confirming Duralt FC performance from Alain Faure of Elf Antar France, June 5, 2000.

25).September 11, 2001, Total Fina Elf/Polar Molecular Corporation Joint Marketing Agreement.

26). January 2002 Minutes of Meeting (Solaize, France) by Bernard Damin of TFE to Mark Nelson with forecasts of $40 million initial purchases of Duralt FC by TFE, conditioned on PMC launching the U.S. market to oil companies.

27). A subsequent, October, 2002 Public Announcement by TFE/PMC of the joint Market Agreement.

28). Lockhart/PMC Contracts. (A). August 8, 2001, PMC Exclusive Right to Duralt FC Oxidate. (B). Lockhart/PMC Manufacturing Agreement. October 23, 2002.

29). 1995 Amway/ PMC (Settlement) Licensing Agreement.

30). PMC v Amway Corporation, "et al" Complaint.

31). Amway Complaint Deposition excerpts of testimony, R. Disberger and S. Lehnardt revealing Lubrizol's involvement in the Duralt FC "knock-off" scheme.
32). 2009 FTC Consent Order, Lubrizol and Lockhart.

33). XLP Duralt FC "knock-Off" on Amazon.

34). Amway Freedom Fuel Additive (FFA) on Amway South Africa Website. This is the private label name for Duralt FC by Amway.

35). January 17, 2017 Technical Paper by Alan Smith, Polar Holding Automotive Consultant on benefits of Duralt FC and Carbon Deposits in GDI Engines.

36). SAE Paper by Chevron on CCD/ORI problems in GDI Engines.

FRANK P. STAFFORD 4-11-17

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Current Employment

Professor of Economics	Research Professor	Research Affiliate
Department of Economics	Survey Research Center	Population Studies Center
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My professorial position has included teaching graduate and undergraduate courses in human resources and labor economics and the Economics Research Seminar for undergraduate majors, and Ph.D. thesis supervision. My teaching duties have previously included lecturing in our macroeconomics and microeconomics principles course. Since 2003, I have been offering, for the undergraduate research seminar, 'Economic Analysis of Relational Panel Data.' This seminar makes use of the on-line Panel Study of Income Dynamics (PSID) archive in the Data Center, and focuses on the formulation of economic and social hypotheses and how to construct files which can be subject to analysis to support of reject the hypotheses. Students learn the implications of relational data structures as part of their acquiring 'numerecy' training.

Research as a Research Professor at the Survey Research Center involves design and management of the PSID as a Co-Principal Investigator. The PSID is a long term panel of U.S. families, funded by the National Science Foundation (NSF). Our proposal for support over the period 1997-2001 was funded in July of 1996. In May of 2000 the PSID was selected as one of NSF's 'Nifty Fifty". These are the 50 projects which the NSF identified as most interesting or signficant in their 50 year history. The PSID was the only social science project to be so designated. As of 2010 we were in the NSF 'Top Sixty'. Our current NSF grant covers the period, 2012-2016. Since 2001 I have been intermittently advising a research team in Israel which, in the Winter of 2009-10, received funding to establish a household panel with design features shared with the PSID. In the winter of 2014 and 2015 I worked with a team at th National University of Singapore to develop an national panel for Singapore. This is expected to continue for the forthcoming three years. In July of 2010 I presented a paper on the early childhood preferences for healthy physical activity as shaped by the primary caregiver and how these prefernces persist into early adulthood. In a realted project we are looking at the role of

electronic media in shaping cognitive skills, incuding iconic cognitive skills (with Joseph Golden). This was presented at the International Association of Time Use Researchers to be held at Oxford University in August of 2011. My main current research are is studing the paths to mortgage distress by American families, 2001-2009 and financial adjustments, including the early cashing in of pensions. This has extended to the analysis of non-pension holdings of stocks, 2007-2009 and now we are planning to assess the dynamics of stock market holdings, 2009-2011 and then to 2013. Current research in this area is listed in the publications section and include occupational mobility and economic growth, intrafamily support and mortgage dynamics.

As of April 1, 1999, I became principal investigator of a 4 year project funded by the National Institute on Aging (NIA), "Wealth and Health Over the Life Course in the PSID." This project substantially expands the topics studied in the PSID to include pension wealth of families (derived from pension information from their employers), their health conditions, medical care costs, out of pocket medical expenses, and related domains. This work has been extended by a P01 Project (Robert Schoeni, PI) in which I am Principal Investigator of a project on Intergenerational Economics. I served as a Principle Investigator of the Child Development Supplement (CDS) of the PSID, a project funded by the National Institute of Child Health and Human Development. This project, which has been funded (2003-2009), examines the time use patterns of children and their parents (using the Panel Study on Income Dynamics as the sample frame) and the impact of time use on the child's development as well as the labor market careers of the parents.

In February of 2008 we submitted a proposal to NICHD to continue following the children wo have been in the CDS as they migrate to adult roles in a study entitled, Transition to Adulthood (TA). Several waves of TA data have been collected (2005, 2007-08, 2009 and 2011). The data can now be used to address questions of student loan accumulation and impacts of the Great Recession on the migration into adulthood.

Past projects have involved analysis of large-scale, national probability sample study of household time allocation, a study for which I was Project Director and Co-Principal Investigator. The project, funded by the National Science Foundation, was "Time Use -- Social Accounts and Behavioral Models." The objective of the study was to provide data for an expanded set of national accounts and to develop various behavioral models of household time use. The major results of the study have been published in a volume entitled Time Goods and Well-Being co-edited with Tom Juster and which has been recently used for much of the new time use studies in other countries. Many of the findings were incorporated into a chapter on household production by Reuben Gronau in Handbook of Labor Economics, 1987.

A research paper based on this project is entitled, "Women's Work, Sibling Competition and Children's School Performance", published in the American Economic Review, December, 1987. A subsquent effort was a monograph length paper (with Tom Juster) entitled "The Allocation of Time: Empirical Findings, Behavioral Models, and Problems of Measurement," for the Journal of Economic Literature, June, 1991. This paper has been reviewed in the New York Times (December 19, 1990 and used for the Sunday, March 24, 1991 Week in Review), and other places, including Institutional Investor, Business Week and Newsweek. A paper on the effect of habit formation on time use was also presented at the AEA meetings in January, 1993. Recently,

Jean Yeung of the National Universty of Singapore and I have used time diary data to study the distribution of early childhood investment in young children.

From 1993 to 1999 I was involved with a research project for international comparisons of labor market adjustment to demand and supply shifts, with emphasis on those shifts arising from trade and technology. This work, as part of a project with George Johnson, centered on the theoretical and empirical impact of technological diffusion via outsourcing and other diffusion processes on the standard of living of the technology leader. Our results indicate a quite strong effect of the diffusion of technology (in the so-called technology gap model) on the average real wage as the follower countries adopt the technologies of the leader. This is quite surprising. A robust result from our approach is that overall real welfare in the world rises as the technology gap closes. The working papers were presented at Princeton, Amsterdam, Munich, Paris, London, Leuven, New York as well as the American Economics Association in Los Angeles in the Winter of 1993. A summary note was published in the May, 1993 American Economic Review. Part of our findings were incorporated in our chapter, "The Labor Market Implications of International Trade," Handbook of Labor Economics, Volume 3, Edited by O. Ashenfelter and D. Card, Elsevier Science, 1999.

George Johnson and developed several subsequent papers in the area. We have evaluated the role of technology shifts in the Postwar British slowdown along the lines suggested by Hicks (1953). We also wrote on the international aspects of labor standards and the various factors shaping the economic slowdown in the O.E.C.D. countries. The main results were presented at the Schumpeter Society in Stockholm, Sweden in June, 1996 and were published as "Technology Regimes and the Distribution of Real Wages", (with George Johnson), in Microfoundations of Economc Growth: A Schumpeterian Perspective (Christopher Greene and Gunnar Eliasson, eds.) University of Michigan Press, 1998. For 1996-1998 we had a grant from the Alfred P. Sloan Foundation to study the general equilibrium effects of the growth in trade in services. We are extending this line of work to study the market equilibrium effects of educational attainment across cohorts by analyzing the panel earnings growth patterns in the PSID and the Current Population Survey (CPS). We found that for the younger college graduate cohorts, working in a industry defined by the Department of Commerce to be an IT industry is predictive of higher earnings and more rapidly growing earnings.

Research on the study of technological changes and innovation has included work on the machine vision industry and the role of job design on coordination of workflows (published in the Journal of Institutional and Theoretical Economics). My research interests include evaluation of programs in both the public and private sector and competition among firms for critical labor inputs. Research projects with faculty from the Electrical Engineering Department on new information technologies as applied to highway sysytems (ITS) have been developed in prior years. Much of the emphasis is on the evaluation of socio-technical systems. In the Winter Semester (1994), Kan Chen (Electrical Engineering) and I team taught a seminar of 15 students (EECS 598) on public-private partnerships in IVHS (Intelligent Vehicle Highway Systems, or the application of information technology to traffic management).

For 1996-2000 I worked on a project with our School of Engineering on the application of new information technology to the trucking industry, funded by the Alfred P. Sloan Foundation. This is a component of the work with George Johnson on 'skill-extensive technical change'.

A public policy evaluation project which used household data from Sweden to determine the influence of price and other factors in a family's decision to participate in the public daycare system. The resulting paper (with Siv Gustafsson) was published in the Journal of Human Resources, Winter, 1992. Also, work on a related topic, parental leave in Sweden and other OECD countries, was completed. This is joint work with Marianne Sundstrom at the University of Stockholm. An initial paper was published in the European Journal of Population, 1992 and the results were presented as part of my address to the European Society for Population Economics in Gmunden, Austria (1992). We subsequently completed a paper on the human capital and signalling effects of time out of the labor force on earnings growth of men and women while I was a visiting scholar at the Demography Unit at the University of Stockholm in the summer of 1994. This paper was presented at the 6th Annual Conference of the European Association of Labour Economists, Warsaw, September, 1994 and was published in Labour (1996).

In an extension of the comparative work of childcare, Siv Gustafsson and I prepared a paper for a National Bureau of Economic Research project on the impact of social protection on economic flexibilty. The paper assesses the impact of daycare and parental leave in the U.S. the Netherlands and Sweden. A preliminary report was offered in Cambridge, Massachusetts in February, 1992. The revised paper was presented at a conference in London in the December of 1992. The paper and other related studies were published (summer, 1994 in a volume entitled, Social Protection and Economic Flexibility: Is There a Tradeoff? (Rebecca Blank, Ed.) University of Chicago Press. We are concluded additional research on this at the Tinbergen Institute and at the University of Amsterdam as part of a project with the Packard Foundation. Much of the research was completed in the summer of 1994 and includes "Equity Efficiency Tradeoffs in Early Childhood Care and Education," a paper on the differences between Sweden, the Netherlands and the U.S. Prepared for the Packard Foundation. This was published in The Future of Children, Volume 6, 1996 and "An International View of the Origins and Effects of Early Childhood Programs on Mother's Earnings and Employment," (with Siv Gustafsson). Working Paper, Department of Economics, University of Amsterdam, February, 1995, and published in a Rutgers University Volume on Early Childhood Care and Education, 1995. A sequel to this has been published in the Arne Ryde Symposium, Economics of Gender and the Family, Lund University, Lund, Sweden, 1997.

A paper on wealth dynamics of American families was presented at the Brookings Panel (March, 1998) and has appeared in Brookings Papers on Economic Activity 1998: I. A paper with Erik Hurst, “Grasshoppers and Ants: Mortgage Refinancing and Bankruptcy”, was revised and resubmitted for publication with a somewhat different title. Another related paper with James Smith and Tom Juster on mesurement of wealth was completed and has appeared in Labour Economics, June, 1999. Another paper (with Juster, Lupton and Smith), on wealth effects of consumption from capital gains in the stock market was published in the Review of Economics and Statistics (2006). A project on family influences on finances is the study of the effect of parental portfolio choice on the choices of young adults. Ngina Chiteji and I have a paper, “Portfolio Choices of Parents and Their Children as Young Adults: Asset Accumulation by African Amercan Families,” American Economic Review, May, 1999, p. 377-380. A related paper is “Financial Market Participation and Pension Holdings Over the Life Course,” (with Elena Gouskova and Ngina Chiteji), research manuscript, Institute for Social Research,

University of Michigan, October, 2004, has appeared in a volume, *Wealth Accumulation and Communities of Color in the United States: Current Issues*. (Jessica Gordon-Nembhard and Ngina S. Chiteji, eds.), 2006.

Since 1998 we have conducted a series of methodology studies on event history calendars (EHC) (with Robert Belli and William Shay). The studies have been published (one in Public Opinion Quarterly and one submitted as a manuscript). Based on this methodology work the PSID will be utilizing computerize EHC methods on employment timelines, 2000-2003 in the 2003 and 2005 data collection. A current project is the 2009 Sage Foundation Conference Volume (Conference held in June 15-17, 2006) , Calendar and Time Diary Methods: Measuring Well-Being in Life Course Research. This will reviews recent developments in these areas and illustrate substantive research results based on these types of measurements. A recent publication is on maintaining response rates in panel surveys (with Robert Schoeni, Patricia Andreski and Katherine McGonagle) "Response Rates in National Panel Surveys" was published in the Annals of the American Academy of Political and Social Science, January 2013. A related presentation in Washington, D.C. at a meeting on redesigns of the Consumer Expenditure Survey data collection system.

From 2011-2016 I was a member of the Technical Advisory Committee to the Bureau of Labor Statistics of the U.S. Department of Labor. This involves the evaluation of key date needs, daa quality and research purposes on major BLS surveys. I was lead the assessment of the measures used to capture job search and the construction of the national unemployment rate.

Over the period, 2009—2015 I have served as a member of a research group assessing mortgage lending policy and behavior. The first meeting was in February 2009 in Melbourne Australia at the request of the Reserve Bank of Australia. There has been on-going coordination of ideas and in the fall of 2014 there was another meeting of the research group in Holland. In 2015 I presented seminars at the Royal Melbourne Institute of Technology on the financial behavior of famies during the Global Financial Crisis, with specific emphasis on mortgage distress and stock market activity.

Other Duties and Activities

Board of Editors of the American Economic Review, 1976-1978.

Referee for manuscripts submitted to the American Economic Review, Journal of Economic Literature, Journal of Political Economy, Econometrica, Journal of Human Resources, Industrial and Labor Relations Review, International Economic Review, Quarterly Journal of Economics, Review of Economics and Statistics, Journal of Institutional and Theoretical Economics, Review of Economic Studies and other journals. Proposal review for NSF, NIA, NICHD and other funding agencies.

Director Federl Reserve Survey of Consumer Finances Panel 1967-1969

Placement Director
Ph.D. program
Department of Economics, 1985-1991

Associate Director, Institute for Social Research, 2000 – 2002.
Acting Director, 2003.

Director, Panel Study of Income Dynamics, 1994-2009.

Awards Recognition

Distinguised Service Award, U.S. Department of Labor, 1974

Fellow, Society of Labor Economists, 2008 -

Selected for Innovative Social Science project, National Science Foundation, 2013

International/Comparative Projects

Visiting Scholar
Industrial Institute for Economic and Social Research
Stockholm, Sweden S-11485, 1984, 1990

While in Sweden I conducted research on labor market adjustment and retraining and on the labor contract aspects of the firm. I previously visited in 1979 to work on a conference on the Swedish labor market. Research projects include those on economics of overtime and capacity utilization, and inventory demand, analysis of the Chrysler loan guarantees, and comparative analysis of Swedish and U.S. microdata. In 1990 work was completed on an inventory of time use research in Sweden.

Visiting Scholar
Universitat Des Saarlandes
Saarbrucken, Germany, 1986

Position involved a series of lectures on new directions of labor economics research and collaborative research with labor economists in Europe.

Visiting Researcher
Arbetslivcentrum
Stockholm, Sweden, 1988, 1990

Position involved lectures at the Center and in Stockholm and research for a paper examining factors which influence the use of public day care in Sweden. Study of the Swedish parental leave system applying hazard models to company data was the main focus in 1990.

Visiting Professor
Department of Economics
Tinbergen Institute
Amsterdam, Netherlands 1992, 1994, 1996 and 1999.

Position involved presenting lectures on time use research and the impact of technology transfer on the wages of advanced industrial economies. In 1994 additional lectures are planned. Comparative work on daycare systems and the labor market is planned as part of a project with the Packard Foundation. I was also the outside examiner for a Ph.D. defense in the area of labor economics by Henriette Maassen van den Brink in 1994. In 2002 I will be working with colleagues at the University of Amsterdam to assess the European research infrastructure on children's well-being.

Visiting Researcher, Demography Unit
University of Stockholm
Stockholm, Sweden, Summer 1994

Position involved lectures at the Demography Unit at the University of Stockholm and research for a paper which examines factors which shape the career outcomes of men and women who use parental leave in Sweden.

Co-organizer of the International Conference on Income and Expenditures, Santa Fe, New Mexico, June 12-14, 1997.

Co-Chair Scientific Selection Committee, Joseph A. Schumpter Society, 1996 (Stockholm)

Chair, International Workshop on Panel Studies, Ann Arbor, Michigan, October, 2000.

Previous Employment

Chair
Department of Economics
University of Michigan, 1980-83

Special Assistant for Economic Affairs
Office of the Assistant Secretary for Policy,
Evaluation and Research
U.S. Department of Labor
Washington, D.C., 1975-76

Position involved serving as economic consultant to the Assistant Secretary for Policy, Evaluation and Research, and to the Secretary of Labor and the Under Secretary. Duties included providing the Assistant Secretary and Secretary with information and guidance relevant to the Secretary's membership and participation in various Cabinet level bodies concerned with broad economic affairs as well as providing the necessary input to Departmental decisions related to economics. Specific assignment areas included the Domestic Council Task Force on Food Stamp Program Reform, Pensions and Social Security, Occupational Safety and Health Administration standards, minimum wage, and evaluation of Federal Unemployment Insurance benefits. Received Special Achievement Award in October, 1976.

Associate Professor of Economics
Department of Economics
University of Michigan
Ann Arbor, Michigan 48109, 1971-1975

Project Director, NSF financed and AAUP sponsored study on the Economic Status of the Academic Professions. Study analyzed the structure of earnings of Ph.D. holders in academics and government. Also analyzed the earnings patterns of women PhDs. Referee for manuscripts submitted to the American Economic Review, Journal of Political Economy, and Journal of Human Resources, Annals of Economic and Social measurement and other journals. Research included work on a national study of time use financed by the National Science Foundation, Supervision of Ph.D. dissertations in the area of labor economics, life cycle acquisition of personal skills, human resources, consumer behavior including portfolio theory.

Visiting Associate Professor of Economics
Graduate School of Business
Stanford University
Stanford, California 94305, 1973-74

Position involved was much the same as at the University of Michigan in terms of research activities. Taught courses in the M.B.A. Program and Sloan Executive Education Program.

Assistant Professor of Economics
Department of Economics
University of Michigan
Ann Arbor, Michigan 48109, 1968-1974

Position included teaching and, also, work as a Study Director and Assistant Professor of Economics. Study Director Appointment was in the Economic Behavior Program of the Institute for Social Research. Worked on a national panel study of households to provide a data base on stock-flow variables defining income, employment, consumption and financial portfolio under a grant from the Ford Foundation. Taught courses in price theory and national income theory. Research also included work on lifetime earnings and school quality under a grant from the National Science Foundation.

Education

Ph.D.
University of Chicago
Graduate School of Business, 1968

M.B.A.
University of Chicago
Graduate School of Business, 1964

B.A.
Northwestern University, 1962

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151. “Interviewing with cell phones: trends and effects on data quality and operation costs in the Panel Study of Income Dynamics,” with Elena Gouskova, April Beaule,and Katherine McGonagle and Frank Stafford (University of Michigan), paper for presentation at the University of Essex workshop, July 13-15, 2008.

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159. "Mortgage Contract Decisions and Mortgage Distress: Family and Financial Life Cycle Factors," Frank P. Stafford, Bing Chen and Elena Gouskova,Working Paper, Michigan Retirement Research Center, Institute for Social Research, 2010.

160. "Shaping Health Behavior Across Generations: Evidence from Time Use Data in the Panel Study of Income Dynamics and its Supplements," (with Ngina S. Chiteji) paper presented at the plenary session of the 32nd Time Use Conference, Time budgets and Beyond: the Timing of Daily Life, Paris City Hall. July 7, 2010. Annales of D'Economie et De Statistique (Annals of Economics and Statistics), Number 105/106, January/June 2012, p.185-207.

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162. "Applying Event History Methods in a National Panel," (with April Beaule), Paper for the 2nd Panel Survey Methods Workshop, Mannheim, Germany, July 5, 2010.

163. "Non-Response in Panel Surveys," (with Robert Schoeni, Katherine McGonagle and Patricia Andreski), The Annals of the American Academy of Political and Social Science, January, 2013 (Sage Publications), Douglas S. Massey and Roger Tourangeau, eds.

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166. “At the Corner of Main and Wall Streets” Working paper, Michigan Retirement Research Center, 2013 (with Thomas Bridges), WP2012-282, for plenary session presentationat the University of Colorado Summer Conference on Consumer Financial Decision Making, May 19-21, 2013. Under revision. Selected rsults reported on National Public Radio. May, 2014.

167. “Measuring Time Use of Older Couples: Lessons from the Panel Study of Income Dynamics,” with Vicki A. Freedman, Fred Conrad and Norbert Schwarz, Field Methods, 2012.

168. “Does Time Fly When You Are Having Fun? A Day Reconstruction Method Analysis,” with Vicki A. Freedman, Frederick Conrad, Jennifer Cornman and Norbert Schwarz, Journal of Happiness Studies, 2013.

169. “Diminishing Margins: Housing Market Declines and Family Financial Responses,” (with Erik Hurst and Bing Chen), Working paper, WP 2012-276, Michigan Retirement Research Center. Under review at International Review of Housing Policy, May 2015.

170. “Stock Market Participation: Family Responses to Housing Consumption Commitments,” (with Bing Chen). February, 2014. Journal of Money Credit and Banking, 2016. Presented at the April 12, 2014 workshop of the Michigan Retirement Research Center.

171. “Stock Market Dynamics, 2009-2013,” with Bing Chen, May 2014.

172. “A Farewell to Arms? Three Regimes of Adjustable Rate Mortgages,” (with Bing Chen) in progress.

173. “Relocation, Intergenerational Transfers and Extended Family Insurance,” (with Yipei Cao) March, 2017 (under review.

174. “How Important are Parental Occupations to the Mobility of the New Generation’s Occupational Mobility?’ (with Susan Lee). Ppaer fro presentation at the Societyof Labor Economists, May, 2017.

Other Professional and University of Michigan Activity

Director of Graduate Studies, Department of Economics, 1978-1980

Natural Resources Program Review Committee

Rackham Non-Traditional Fellowship Committee.

Research Project on the Swedish Labor Market, 1979 for the Industrial Institute for Economic and Social Research, Stockholm.

Michael Aho developed a river simulation for use in teaching microeconomic theory. This simulation has been used in Economics 401 (intermediate microeconomics) and Economics of the Environment. The model has been exported to several schools through the center for Research in Learning and Teaching. The model was expanded and improved by a research grant from RAND (through the School of Public Policy).

Review of grant proposals for the National Science Foundation.

Research Associate, National Bureau of Economic Research, Cambridge, Massachusetts, 1980-1985.

Ph.D. Placement Director, Department of Economics, University of Michigan, 1984-1991.

Chair, National Academy of Sciences Committee on Jobs and Inequality.

Advisory Panel, Evaluation of the Job Training Partnership Act (JTLS Project).

Who`s Who in America, 1984-85 forward

Who's Who in Higher Education, 1995 forward

Who's Who in the Midwest

Who`s Who in the World 2003 forward. (General and Social Science designation)

Who's Who in Economics, Fourth edition, (Elger Publications, U.K.) 2003.

Member, Small Grants Panel, Employment and Training Administration, U.S. Department of Labor, 1978-1980.

Member Social Science Research Council Panel on Doctoral Dissertation Fellowships in Employment and Training, 1981-1984.

NIH Research project on time use and Down Syndrome, 1987 (with Tom Juster).

Project with the Army Research Institute with (Charles Brown) to evaluate the reenlistment decision.

Member, Review Committee, Doctoral Program in Architecture, University of Michigan.

Member, Evaluation Committee, Department of Economics, University of Illinois.

Member, Technical Review Panel, U.S. Department of Labor, National Longitudinal Surveys.

Member, Evaluation Committee, Department of Economics, University of Texas (1997).

Member, Salary Equity Committee to Study Staff Compensation at the University of Michigan, 1990-91.

Member, Executive Committee, Program in Urban, Technological, and Environmental Planning.

Director, Master's in Applied Economic Program, University of Michigan 1992-93.

Member, Social Science Divisional Review Committee, College of Literature Science and the Arts, 1994.

Member, Admissions Committee, Ph.D. Program, Department of Economics, 1994 - 1996.

Member, Promotions Grievance Committee, College of Literature Science and the Arts, University of Michigan, 1997.

Member, Budget Committee, Senate Advisory Committee on University Affairs, University of Michigan (term set for 1994-1997) Chair 1996.

Member, Provost's Advisory Committee on University Budgets, 1995, Chair, 1995-1996 and 1996-2001.

Member, Institute for Social Research Policy Committee, 1997-1999.

Member, Survey Center Advisory Committee, Survey Research Center, 1999 – 2001.

Advisor to the Israeli Panel Study, 2000-2010.

Chair, Dispute Review Board of the Vendor Code of Conduct of the University of Michigan, 2005-2007.

Chair, Committee on Civil Liberties, 2012-2013 Organized a campus symposium on the Fisher versus University of Texas Austin case, scheduled for October 10, 2013.

Member, Technical Advisory Committee , Bureau of Labor Statistics, U.S. Department of Labor, 2011-2016.

Recent courses taught:

Undergraduate: Research Seminar on Micro Panel Data (495) Since 2003
Economics 490 Topics: New Dimensions to Ability and Utility (490) 2012 and 2013
Economics 490 Topics: Cognition and Contagion in Economic Networks (490) 2015 and 2016

Recent Advisees:

Bing Chen Ph.D. thesis (Chair)
Joseph Golden thesis (committee member)

Thomas Bridges (committee member)
Aditya Aladangady (committee member)
Yipei Cao Third Year Paper adviser and Committee Chair
Ben Lisius Third Year Paper adviser
Xiaoquing Zhou (committee emember)

Recent department service:

Director of Undergraduate Honors Progam in Economics snd Faculty Adviser to the Michigan Economic Society (undergraduate association of economics majors)

Recent university service:

Academic Evaluation Committee

Committee of Civil Liberties, Chair 2013-14; Member 2014-16

Recent Honors and Activities

Fellow, Society of Labor Economists

Who's Who in Economics

National Academy of Sciences/CNSTAT Committee to Assess the Future of Social Survey

Census Committee to Redesign the Consumer Expenditure Survey

Panel Study of Income Dynamics selected as the only social science project in the NSF 'Nifty Fifty/Sixty (2001, 2011)

University of Essex Conference on the United Kingdom Household Longitudinal Study – Plenary Opening Speaker July 2011

Oxford University Conference Plenary Opening Speaker (IATUR) August 2011

Director, Undergraduate Honors Program in Economics, 2011 –

Member, Technical Advisory Committee, U.S. Departmnet of Labor, Bureau of Labor Statistics, 2012 – 2016

Panel Member, Committee to Evaluate the National Center for Research Methods, University of Southampton, England, 2012

Presentation and lecture, Panel methods conference, Beijing China, May 26-June 1

Presentation on Mortgage Distress, Conference on Panel Research, Kansai University, June 3-5, 2012

Plenary presentation on Pension Management, Summer Conference on Financial

Behavior, University of Colorado, May 19-22, 2013

Advisor on the design of the 14th wave of the British Mellinium Cohort Study, London, June 10-11, 2013.

Technical review Bureau of Labor Statistics, U.S. Department of Labor, defining unemployment when job seekers use the internet, Washington, D.C., June 21, 2013.

Presentations at the Institute for Policy Studies of the National University of Singapore on the research opportunities from a national intergenerational panel of familes. January, 2014 and 2015. The emerging project is now the Singapore Panel Study of Social Dynamics.

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Participant, research group on housing and mortage dynamics, Holland, October 2014.

University Lectures, National University of Singapore, Institute fof Policy Studies and Department of Sociology – Research on Economic Dynamics Using Panel Methods (March 2015)

Financial Behavior of Families, presentations at the Royal Melbourne Institute of Technology, November, 2015

Assessment of Earnings Opportunities of the Polar Molecular Corporation, Polar Molecular Holding Corporation, and the Nelson Founders and Inventors.

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INTRODUCTION

The purpose of this report is to provide an economic assessment of the income opportunities of the Polar Molecular Corporation (PMC) the parent, Polar Molecular Holding Corporation (PMHC), and the Nelson, Founders and Inventors. The report covers the period 1993-2016 and for the period going forward, 2017-2030. The income from previous diverted ventures, while a loss in its own right, creates a current, but surmountable challenge to and learning experience for revenue opportunities going forward from 2017. These future revenue opportunities are evaluated. While the technology and activities of PMC extend back to the early commercial activity in the mid-1980's, the report offers an assessment of three prior major business plans, plus a fourth, 2017 forward..

The first was the opportunity, starting in 1988 and leading to tests in 1988, and commencing in 1990 with an agreement with ELF, part of the Elf Aquitaine Group. This should have led to the planned 1993 launch of Duralt FC in all Elf gasoline in Western Europe and in Elf additive packages in Indonesia. This finally led to a Joint Market Agreement with Total/Fina/Elf (TFE) in September 2001. The plan was the marketing of Duralt FC plus TFE detergent additives for bulk treatment by refiners. Total/Fina/Elf, was a major European refining company. (In 2003 the three companies merged to become Total, the fourth largest oil company in the world).

A second opportunity was to merge with Octel, a division of Great Lakes Chemical. The business plan was to phase out tetraethyl lead (TEL) as an octane enhancer and to market Duralt FC as a substitute for TEL to Oil Companies.

The third business plan was to sell to the full U.S. gasoline market. Commencing in 1984 Ford Motor had assisted in the validation of Duralt FC for

the auto industry because of the ability of Duralt FC to reduce Combustion Chamber Deposits (CCD) and Octane Requirement Increase (ORI) in gasoline engines, thus improving fuel economy and emissions. At this time, Ford was typical of all American automobile companies, investing millions of dollars to improve fuel economy across the board. The problem was that, in order to meet Federally mandated fleet average fuel economy (CAFÉ) standards, Ford had to sell a lot of small, unprofitable cars to permit sales of larger, less fuel efficient, but profitable vehicles. Ford engineers understood that if a CCD/ORI reducing fuel additive were present in all gasoline, it provided them with an unprecedented five percent fuel economy opportunity and they were eager to support PMC in their efforts. Ford recommended certain accepted auto/oil industry tests, and approved laboratories to run tests to verify Duralt FC ability to reduce CCD/ORI in gasoline engines, thus assisting Ford and other auto companies to meet government required fuel economy and emission standards. This support and the recommendations by Ford culminated in the publishing by the International Society of Automotive Engineers (SAE) of the first technical paper on Duralt FC in 1989.

Following this, the Special Vehicle Operations department at Ford considered marketing DurAlt FC in the so-called "after-market." Ford developed a list of verified performance claims for the product. Ford then advised PMC to partner with a major oil company to combine Duralt FC with gasoline detergent additives and to commercialize Duralt FC to the oil industry. Ford also agreed to request the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA) require Duralt FC in all U.S. motor gasoline once this was accomplished. In September 2002, TFE, accompanied by PMC made a presentation, (P-910, P-911) to the Ford Motor Company verifying the CCD/ORI benefits of Duralt FC

combined with TFE, and other detergent additives. After the presentation Ford agreed to assist PMC and TFE with CARB, and with EPA.

The plan was for an initial requirement for use of Duralt FC in all motor gasoline by CARB and a related regulatory requirement by EPA, with the support of the Ford Motor Company. The target was to have, by 2005, sales to the full U.S. gasoline market. (Duralt FC has been deemed "substantially similar" (to gasoline, and therefore allowed for bulk-treatment of U.S. motor gasoline. Duralt FC also meets all the requirements of the World-Wide Fuel Charter published by all the automobile companies and engine manufacturers as a fuel and fuel additive standard for the oil industry).

The fourth and current opportunity is the assessment of global marketing at the refinery level, 2017- 2030.

I. THE PRODUCT GROUP

Polar Molecular Corporation was founded by the Nelsons in 1984 and in 2003 became the wholly owned subsidiary of Polar Molecular Holding Corporation headquartered in Highlands Ranch, Colorado. Early assessment of Duralt FC was carried out by Ford beginning in 1984. The product group achieved 39 patents and 15 trade names which define Duralt FC fuel additives to be sold to petroleum refiners, fuel distributors and directly to consumers. The additive was in the first instance a substitute for TEL or other metallic based octane performance enhancers. More widely, Duralt FC is designed to control combustion chamber deposits (CCD) and to reduce octane requirement increase (ORI) in gasoline engines.

The market for such products has been growing, with continued high levels of fuel use in developed economies. As developing economies have sought to phase

out TEL and other metallic additives through less expensive options than implementing new, capital-intensive refinery modifications, such additives are an attractive alternative. (Duralt FC-1991 SAE Technical Paper # 911739, Octane Requirement Increase Control-A New Way of Saving). (Duralt FC-Advanced Fuel Additive Technology for Cost Effective Gasoline Lead Phaseout by Control of Octane Requirement Increase, U.N. Special Session on Environment and Development June 1997).

At present, the global auto industry continues to invest millions of dollars in engine technology to further improve fuel economy. Government mandated standards, customers, and the need to address climate change drive this effort. The latest engine technology, Gasoline Direct Injection (GDI) has made the demand for CCD/ORI control even greater than before. These engines have seen dramatic increases in market share and appear to be central in meeting government emission and fuel efficiency standards. These engines, in contrast to the traditional Port Fuel Injected (PFI) engines, are more dependent on control of Combustion Chamber Deposits (CCD), which lead to octane requirement increase (ORI) increased fuel consumption and emissions as the engines log in miles early in their life cycle. As this occurs a variety of ad hoc solutions has arisen, imposing cost and inconvenience burdens on the owners of GDI engine-equipped vehicles.

In short, the products offered by PMC notably include Duralt FC, an additive that controls and reverses combustion chamber deposits (CCD) in both PFI and GDI engines and limits the ORI. These provide both the direct benefits to the vehicle owner through better mileage and performance while also having beneficial effects for the environment through reduced greenhouse gas emissions and improved fuel economy. (Duralt Fuel Conditioner and Carbon Deposits in GDI Engines, Alan Smith January 17, 2017). Other products include Duraflo, which

provides improved fuel flow for diesel fuels in cold climates, and Durasta, which improves fuel stability by inhibiting oxidation.

II. PROJECTED RETURNS FROM THREE BUSINESS PLANS

A. Elf 1993 market launch of Duralt FC, 2001 TOTAL/Fina/Elf, PMC WORLDWIDE MARKETING VENTURE

Starting in 1988 the assessment of an opportunity with Elf began with successful ORI tests by Elf on Duralt FC. This lead to an Option to License agreement in 1990 and resulted in extensive testing of Duralt FC by Elf in 1991-1992. This was to lead to a launch of Duralt FC in all Elf gasoline in Western Europe in 1993, and in Elf detergent packages in Indonesia. This market launch would have produced substantial net income for PMC from 1993-2002. As of September 11, 2001, PMC reached a joint marketing agreement with the combined Total Fina Elf to sell Duralt FC throughout the world for bulk treatment at the refinery level (TOTAL-FINA-ELF Additive/PMC announcement in 2002). This venture would have produced substantial net income[1]. The volume and net income assessment, 1993-2016 is set out in Table 1.

As can be seen in Table 1, modest net revenues of about $150 million begin in 1993. By 2004, annual net income is approximately $600 million as the market from India develops. With the price spike in gasoline in 2005, it is assumed that the price per gallon rises to $40, costs are illustrated at $17 for a net return of $23 per gallon. Annual net revenue becomes approximately $900 million. On a cumulative basis, for 1993-2016 the net revenue is **$13,032,780,000**.

[1] While the overall sales in France had declined some from a 2011peak (see Chart 1 below), the sales potential for one year, 2014, can be seen in Table 1A.

				TABLE 1			
	NET INCOME TOTAL/FINA/ELF-PMC VENTURE 1993-2016						
Year	**Europe**	**ndonesia**	**India**	**Gallons 1,000**	**REVENUE**	***Net Income****	**CUMULATIVE ($1,000)**
1993	2,000	18,200		20,200	303,000	$ 151,500	$ 151,500
1994	2,000	18,200		20,200	303,000	$ 151,500	$ 303,000
1995	2,000	18,200		20,200	303,000	$ 151,500	$ 454,500
1996	2,000	18,200		20,200	303,000	$ 151,500	$ 606,000
1997	2,000	18,200		20,200	303,000	$ 151,500	$ 757,500
1998	2,000	18,200		20,200	303,000	$ 151,500	$ 909,000
1999	2,000	18,200		20,200	303,000	$ 151,500	$ 1,060,500
2000	2,000	18,200		20,200	303,000	$ 151,500	$ 1,212,000
2001	2,000	18,200		20,200	303,000	$ 151,500	$ 1,363,500
2002	2,000	18,200		20,200	303,000	$ 151,500	$ 1,515,000
2003	8,380	18,200	13,000	39,580	593,700	$ 296,850	$ 1,811,850
2004	8,380	18,200	13,000	39,580	593,700	$ 296,850	$ 2,108,700
2005	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 3,019,040
2006	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 3,929,380
2007	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 4,839,720
2008	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 5,750,060
2009	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 6,660,400
2010	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 7,570,740
2011	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 8,481,080
2012	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 9,391,420
2013	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 10,301,760
2014	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 11,212,100
2015	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 12,122,440
2016	8,380	18,200	13,000	39,580	1,583,200	$ 910,340	$ 13,032,780
*For 1993 to 2004 the price of $15 with cost of $7.50 per gallon							
For 2005 to 2016 the price of $40 with cost of $17 per gallon							

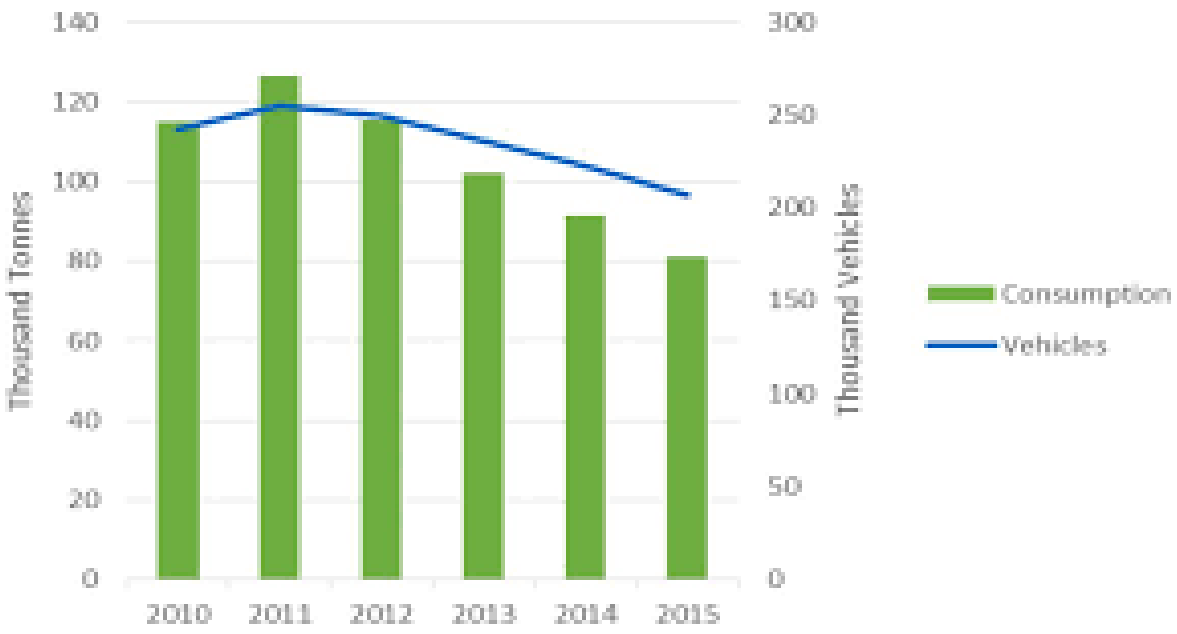
140
120
100
80
60
40
20
0
Thousand Tonnes
300
250
200
150
100
50
0
Thousand Vehicles
2010
2011
2012
2013
2014
2015
Consumption
Vehicles

TABLE 1A

TOTAL PRODUCT SALES 2014 (1000 bl/day)

EUROPE	**1,100**
France	**547**
Out of France	**553**
AMERICAS	**78**
AFRICA	**380**
OTHERS	**211**
Total	**1,769**

B. OCTEL-PMC VENTURE

As of 1998 the plan was to effect a merger between Octel and PMC. This was assessed by Smith Barney in a report dated September 1997(Smith Barney, 1997). The Smith Barney analysis developed several scenarios. One projected a stand-alone spin-off of Octel from Great Lakes Chemicals in a leveraged acquisition. The other considered a merger and developed combined income statements for the years 1998-2003. The resulting merger was seen as an opportunity to market to several developing and developed economies, namely, Indonesia, Thailand, Kuwait, Malaysia, Philippines, China, India, Japan, Saudi Arabia, Mexico, former USSR, Canada and including the United States.

The income projections are set out in Table 2, The Net Income Gain from the Octel-PMC Venture, 1998-2017. The column 'LEVERAGED' has the entries as of 1998-2003 for the stand-alone Smith Barney estimates of income as of 1998-2003. As can be seen the net income was forecast as the market for tetraethyl additive continued to contract with Octel operating in something of a descending net income path. The column 'MERGER' is the net income from the Smith Barney table for the merger, 'Octel & PMC: Combined Income Statement'.

As can be seen, the transition year, 1998, shows a net differential of (-$4,451,000). Thereafter the gains are positive, reaching $40,745,000 as of 2003. The cumulative net gain through 2003 is $151,149,000. Going forward, the income estimate is based on the overall 4.1 percent growth of the projected merger based income. The GAIN so forecast rises to $71,613,000 as of 2017, for a cumulative total of **$932,354,000**. Note that if the gain held steady at $40,745,000 the cumulative total would be **$721,579,000**.

TABLE 2 Net Income Gain from the Octel-PMC Venture, 1998-2017

	year	LEVERAGED	MERGER	*GAIN*	CUMUL PV
	1998	$ 61,592	57,141	$ (4,451)	$ (4,451)
Post-2003 Growth	1999	$ 56,537	71,970	$15,433	$ 10,982
0.041	2000	$ 51,857	80,399	$28,542	$ 39,524
	2001	$ 47,669	81,449	$33,780	$ 73,304
	2002	$ 43,961	81,061	$37,100	$ 110,404
	2003	$ 40,692	81,437	$40,745	$ 151,149
	2004			$42,416	$ 193,565
	2005			$44,155	$ 237,719
	2006			$45,965	$ 283,684
	2007			$47,849	$ 331,534
	2008			$49,811	$ 381,345
	2009			$51,854	$ 433,198
	2010			$53,980	$ 487,178
	2011			$56,193	$ 543,371
	2012			$58,497	$ 601,867
	2013			$60,895	$ 662,762
	2014			$63,392	$ 726,154
	2015			$65,991	$ 792,145
	2016			$68,696	$ 860,841
	2017			$71,513	$ 932,354

$1,000's

C. **CARB/EPA/FORD**

Going back to 1995, Ford and the Automobile Manufacturers Association (replaced by the Alliance of Automobile Manufacturers) had asked EPA to require CCD/ORI additives (Duralt FC) (Automotive News, 1995). Ford Motor Company had validated Duralt FC as a CCD/ORI fuel additive beginning in 1984, and based on tests on Duralt FC recommended by Ford to PMC Ford concluded in 1989 that Duralt FC was the only effective CCD/ORI additive technology in the world market, and Ford provided a list of verified performance claims on Duralt FC.
PMC's Technical paper on Duralt FC, also authored by noted scientists from Columbia University and Pfizer, Inc. was then published by the International Society of Automotive Engineers (SAE). (The Broad Spectrum, Non-Metallic Fuel Additive, Technical Paper # 890214). Ford Motor then requested that PMC enlist a major oil company to help PMC combine Duralt FC with the detergent additives used in gasoline and also help PMC commercialize Duralt FC to the oil industry.

On September 11, 2001 the combined Total Fina Elf (TFE), 4th largest oil company in the world, entered into a world-wide Market Agreement with PMC based on successful research with PMC combining Duralt FC with detergent additives, including TFE detergent additives. In September 2002, TFE, accompanied by PMC, made a presentation to Ford, (P-910, P-911) featuring successful tests of Duralt FC combined with detergent additives, demonstrating excellent CCD/ORI control results. As a consequence of the ORI reduction, Ford staff estimated that about 5% fuel economy can be achieved through engine setting adjustments in new production engines with Duralt FC required by EPA in all U.S. gasoline. At the end of the presentation Ford agreed to help PMC and TFE secure a regulation from CARB and EPA requiring Duralt FC in all motor gasoline in

California and the United States. This required change was endorsed by Ford Motor Company based on testing Ford had recommended and based on 200 engine tests performed by TFE. Had CARB gone forward requiring such an additive it is reasonable to expect that this would have carried over to the wider U. S. market, being then required by the U.S. Environmental Protection Agency (EPA) thus enabling the auto companies, including Ford to meet government fuel economy and greenhouse gas emission standards.

Based on estimated annual gasoline sales from the U. S. Energy Information Agency, the potential income, 2005 -2017 is set out in Table 3, 'Net Income U.S. (CARB/EPA/FORD) 2005-2017. Based on the assumption of 1 gallon of Duralt FC per 10,000 gallons of gasoline and a net income of $70 per gallon, the cumulative net profit value to 2017 is **$13,121,337,165**.

				TABLE 3	
			NET INCOME U.S. (CARB EPA/FORD)		
				2005-2017	
	year	U.S. BBl/day	U.S. Bil BBl/YR	*Net Income**	CUMUL PV
	2005	9159	3.3430	$ 1,001,085,728	$ 1,001,085,728
	2006	9253	3.3773	$ 1,007,765,893	$ 2,008,851,621
Growth	2007	9286	3.3894	$ 1,044,775,721	$ 3,053,627,342
0.04	2008	8989	3.2810	$ 1,010,460,714	$ 4,064,088,056
	2009	8997	3.2839	$ 1,011,809,843	$ 5,075,897,899
	2010	8993	3.2824	$ 1,039,090,652	$ 6,114,988,551
	2011	8753	3.1948	$ 1,019,630,739	$ 7,134,619,291
	2012	8682	3.1689	$ 985,772,076	$ 8,120,391,366
	2013	8907	3.2512	$ 997,396,450	$ 9,117,787,816
	2014	9032	3.2967	$ 997,396,450	$ 10,115,184,266
	2015	9159	3.3429	$ 997,396,450	$ 11,112,580,715
	2016	9287	3.3897	$ 997,396,450	$ 12,109,977,165
	2017	9417	3.4371	$ 1,011,360,000	$ 13,121,337,165
	* Current net income of $70 per gallon				
	The years 2013-2016 are interpolated given limited EIA data for those years				

IV **OPPORTUNITIES GOING FORWARD 2017-2030**

The potential for Duralt FC going forward has become highly attractive. Several important elements combine to make the current conditions more attractive than those in the past. Specifically, these include:

1. Continued U.S. demand and the U.S. is about 40% of the current world market.
2. Rapid growth in emerging economies and the need for ways to realize air quality standards in populous urban centers. [2]
3. Regulations for continued fuel efficiency gains and air quality standards in the U.S.
4. The dramatic shift to Gasoline Direct Injection (GDI) engines in the global auto market.
5. Gains for *all* parties involved: automobile manufacturers, oil companies, motorists, auto dealers and the environmental benefits to the general public.

[2] The U.S. and full world market is set out in Tables 4 and 5. Selected regional breakouts are in Appendix Table 1.

TABLE 4

GASOLINE CONSUMPTION U.S. AND DURALT INCOME

2017-2030 Billion Barrels per Year and Earnings

	year	*US*	CUMUL BBls	EARNINGS/YEAR
	2015	3.34	3.34	**1.4% SALES GROWTH**
	2016	3.39	6.73	**1 Gal. Duralt /10,000 gallons**
Growth	2017	3.44	10.17	**$ 1,011,360,000**
0.014	2018	3.49	13.65	**$ 1,025,519,040**
	2019	3.53	17.19	**$ 1,039,876,307**
	2020	3.58	20.77	**$ 1,054,434,575**
	2021	3.63	24.41	**$ 1,069,196,659**
	2022	3.68	28.09	**$ 1,084,165,412**
	2023	3.74	31.83	**$ 1,099,343,728**
	2024	3.79	35.62	**$ 1,114,734,540**
	2025	3.84	39.46	**$ 1,130,340,824**
	2026	3.90	43.35	**$ 1,146,165,595**
	2027	3.95	47.30	**$ 1,162,211,914**
	2028	4.01	51.31	**$ 1,178,482,880**
	2029	4.06	55.37	**$ 1,194,981,641**
	2030	4.12	59.49	**$ 1,211,711,384**
				$ 15,522,524,497

TABLE 5

GASOLINE CONSUMPTION WORLD AND DURALT INCOME

2017-2030 Billion Barrels per Year and Earnings

	year	*WORLD**	CUMUL BBls	EARNINGS/YEAR
	2015	8.36	8.36	**2.0% SALES GROWTH**
	2016	8.52	16.88	**1 Gal. Duralt /10,000 gallons**
Growth	2017	8.60	25.48	**$ 2,528,400,000**
0.02	2018	8.77	34.25	**$ 2,563,797,600**
	2019	8.95	43.20	**$ 2,599,690,766**
	2020	9.13	52.33	**$ 2,636,086,437**
	2021	9.31	61.64	**$ 2,672,991,647**
	2022	9.50	71.13	**$ 2,710,413,530**
	2023	9.68	80.82	**$ 2,748,359,320**
	2024	9.88	90.69	**$ 2,786,836,350**
	2025	10.08	100.77	**$ 2,825,852,059**
	2026	10.28	111.05	**$ 2,865,413,988**
	2027	10.48	121.53	**$ 2,905,529,784**
	2028	10.69	132.23	**$ 2,946,207,201**
	2029	10.91	143.13	**$ 2,987,454,102**
	2030	11.13	154.26	**$ 3,029,278,459**
				$ 38,806,311,243

The scale of the overall U. S. and world markets can be seen in Tables 4 and 5. The question is: "What are the motivations to adopt?" In the first instance the obvious and compelling reason would be that of a government requirement. This puts all parties on the same footing and is central to efficient adoption. Yet a requirement suggests some burden. Who would gain from adoption at the refinery level? What about motorists? Consider the opportunities at the perspective of a gallon of gasoline at $2.20. If Duralt FC leads to even as much as a 5% increase in fuel efficiency[3] this is worth $0.11 per gallon.

At $100 per gallon for Duralt and treating 10,000 gallons of gas per gallon, this is $0.01 for the additive cost to the retail gasoline distributors. Suppose the retail gasoline distributors mark up the cost by an additional $0.02. This leaves a net savings to the motorist of $0.08 per gallon based on Ford Motor's estimate of 5% fuel economy improvement with Duralt FC (Automotive News, 1995). For the gasoline distributor this increase in margin is notable for 87 Octane and the buyers of higher grade gasoline will also get performance benefits which they should be willing to pay for – given their current willingness to buy the best. These elements have likely been present throughout the period, 1998-2017.

What is new and central to all parties is the rapid adoption of the Gasoline Direct Injection engine. As of 2008 about 2.3 % of the new vehicle market in the U.S. was for GDI engines and by 2015 it had risen to an estimated 45 %. The range of vehicles using GDI includes the Cadillac ATS 2.5 liter four-cylinder engine, the Mazda Sky active engine and the Ford Eco boost engine. In Europe the GDI share is even higher than in the U.S. The GDI design replaces engines based on Port

[3] Bosch estimates a better than 10% gain from GDI engines..

Fuel Injection (PFI) but places added demands on achieving persistently improved combustion with conventional gasoline grades.

The combustion challenge (CCD and ORI) is now becoming evident to not only the industry, as reported in numerous technical studies, both over the years and recently (Xu, et.al., 2015; Chevron, SAE 2011-01-2110, Direct Injection Spark Ignition Engine Deposits Analysis: Combustion Chamber and Intake Valve Deposits; Zbigniew Stepien, Intake valve and Combustion Chamber Deposits formation-the engine and fuel related factors that impacts their growth; Lubrizol May 13, 2014 Technical Paper presented at the Israeli Fuels Seminar, Tel Aviv, (GDI, "Lubrizol Additive" for CCD, IVD, page 115-121) ; Duralt Fuel Conditioner in GDI engines, Alan Smith, January 2017), but also to the wider public. For example, from Consumer Reports:

"The result [of GDI] is more complete combustion and cooler cylinder temperatures that enable a higher compression ratio for greater efficiency and power. Engine technology supplier Bosch says that direct injection can return a 15 percent gain in fuel economy while boosting low end torque by as much as 50 percent."

Further:

"Although the breakthrough seems like a dream come true, an unwanted side effect has been emerging. Letter writers have complained to Consumer Reports and the National Highway Safety Administration (NHSTA) that over time DI can lead to clogged fuel systems and engine carbon buildup. The result can be hesitation and a loss of power."

See also Wikipedia, Gasoline Direct Injection Drawbacks.

From these engine difficulties manufacturers have issued Technical Service Bulletins (TSB's) on ways to deal with the problem, such as having the motorist

add fuel system cleaner periodically. Sometimes costly engine repairs have been involved.

The application of a low cost and effective additive to deal with these issues should be a benefit for all. For those who have purchased a vehicle with a GDI engine and have logged in miles, Duralt FC can reverse the accumulated build up. For new owners the adverse effects can be avoided. So the gain to motorists, including better mileage, seems evident. Even with a modest price increase there are net fuel saving costs and performance benefits. So the net fuel savings creates a cash gain for motorists.

On this basis the automobile industry has an interest in this low cost solution. This is particularly true given the capital outlays to create a worldwide capacity in GDI engines. Keeping the customer base happy is always a good idea. From the perspective of the gasoline retailer, motorists may place blame on them too. Again, keeping the customers happy does matter. The motorists who have been attracted to premium grades are likely to continue to do. For them the vehicle outlay is high and the higher pump price is a modest cost for the assurance that they are buying the best for their vehicle. For the full public the opportunity for continued environmental gains may not register in the marketplace but is certainly a plus. Moreover this is a low cost way for the auto manufacturers to achieve fuel economy improvements, whether mandated or not.

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APPENDIX TABLE 1

COMPONENTS OF THE EXPANDING MARKET OF DURALT (2012)

	DAILY	ANNUAL	
WORLD	22,451	8,195 billion bbl	
US+CANADA	10,251	3,741	
EUROPE	3,000	1,095	
ASIA	5,971	2,179	(average increase/yr 5%)
AFRICA	870	317	(average increase/yr 7%)
S.AMERICA	1,225	447	
C.AMERICA	160	58	(5% increase)
CHINA	1,908	696	(7 % increase)
JAPAN	978	357	(small decrease)
4TIGERS	1,029	376 (avg increase 2002/12:46%)	
RUSSIA (1991)	1,600	584 (no data since ‘91 Huge mkt)	