Technology Insight Report

Fuel Additives

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Fuel additives have been one of the most prolific innovations of liquid engineering as well as material science giving natural fuel sources additional properties which help us drive that little extra out of them. Whether it's an additive to alter a fuels burn rate, increase surface area, prevent corrosive effects or simply color, innovators have developed a range of additives over the years which give these fuels an added property which serves a pressing need from consumers.

This report takes a look into this fascinating area of fuel additives uncovering the inventors, patents, the companies and the intellectual property history behind these small additives which effect huge changes.

Overview

Introduction to Fuel Additives

While fuel additives are largely associated with additives to gasoline and oil based fuels in the interest of environmental protection, curbing emissions and increasing mileage, the innovation around additives has a broader impact of being able to change, alter or enhance specific attributes of a fuel whether liquid, solid or gas. Additives have been developed to increase combustion rates, as anti oxidants, to effect burn rates, to enable fuels to work under extreme temperatures, reduce harmful emissions and more. Over the years various hybrid compounds and blends have been engineered to create better fuels for industries, commercial use and end consumers alike.

Categories & Types of Fuel Additives

According to a source wiki on autoropolis.com on the topic of fuel additives:

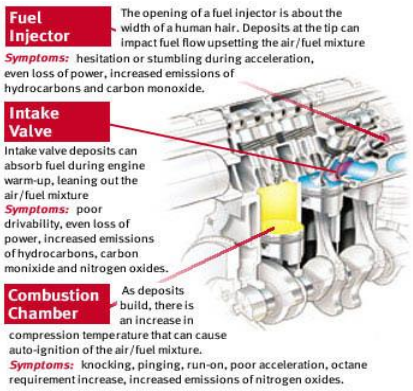
The types of additives include oxygenates, ethers, antioxidants (stabilizers), antiknock agents, fuel dyes, metal deactivators, corrosion inhibitors and some that can't be categorized. Let's take a closer look.

• Oxygenates – are fuels infused with oxygen. They are used to reduce the carbon monoxide emissions creating when burning fuel. Oxygenates can be based on either alcohol or ethers.

• Alcohol – methanol, ethanol, isopropyl alcohol, n-butanol, and gasoline grade t-butanol
• Ethers – methyl tert-butyl ether, ethyl tertiary butyl ether, diisopropyl ether, tertiary amyl methyl ether, tertiary hexyl methyl ether.

• Antioxidants –Some antioxidants are used as a stabilizer in fuel to prevent oxidation. Examples of some antioxidants used are:
• Butylated hydroxytoluene
• 2,4-Dimethyl-6-tert-butylphenol
• 2,6-Di-tert-butylphenol
• Phenylene diamine
• Ethylene diamine

• Antiknock Agents – is a gasoline additive that works to reduce engine knocking while trying to increase the octane rating of the fuel. The mixture of air and gas in a traditional car engine has a problem with igniting too early and when it does, it causes a knocking noise. Some of the antiknock agents are:



A marketing demo by Chevron for its line of fuel additives which tackle various engine issues such as corrosion, oxidants, emissions and engine knock among others.

Ethanol (Ethyl Alcohol or Grain Alcohol) is commonly used in alcohol. The recent surge in interest for alternative fuel sources is driving research to use Ethanol as a transportation fuel source. The articles on this page deal with this form of ethanol use. There is still a great deal of debate about the pros and cons of ethanol as fuel. Ethanol is commonly used as a fuel source additive and not as a fuel substitute.

Source: http://www.alternative-energy-news.info/technology/biofuels/ethanol-fuel/

• Tetra-ethyl lead
• Methylcyclopentadienyl manganese tricarbonyl
• Ferrocene
• Iron pentacarbonyl
• Toluene
• Isooctane

• Fuel Dyes – are dyes that are added to fuels. Some countries dye a fuel that is taxed at a lower rate to identify it when used incorrectly. Untaxed are the dyed fuels and taxed fuels are clear. For example, in the United Kingdom, the fuel they use for agriculture and construction vehicles are taxed at a different rate than for fuel used for commuter vehicles. They dye this fuel red. If a vehicle is found to have this fuel in it and not being used for the express purposes that it was intended for then there is a heavy penalty involved. The most often used colors are:
• Solvent Red 24 and 26
• Solvent Yellow 124
• Solvent Blue 35

• Metal deactivators – are fuel additives and lubricant additives that are used to stabilize the fuel. It works by deactivating metal ions. Metal deactivators inhibit the formation of gummy residues. An example of a metal deactivator that is often used for gasoline is N,N'-disalicylidene-1,2-propanediamine. This compound has been approved for both military and commercial use.

• Corrosion inhibitors – these chemical compounds slow down metal corrosion. A good corrosion inhibitor will give 95% inhibition in certain circumstances. Examples of some corrosion inhibitors are sodium nitrite, hexamine, and phenylenediamine.

• Others –there are several other fuel additives that don't fall into the same categories as the above. Some of these are:

• Acetone – this is a vaporization additive. It is used, together with methanol, to improve vaporization when the engine starts up.
• Nitromethane – is used to up the engine power – commonly referred to as 'nitro.'
• Ferrous picrate is used to improve combustion and increase mileage.
• Ferox – this is a catalyst additive used to:
• Increase fuel efficiency
• Clean the engine
• Extend the life of the engine
• Lower emissions

Source:
http://www.autotropolis.com/wiki/index.php?title=Fuel_Additives:_The_Real_Story

Markets for Fuel Additives

A special report published in 2009 forecasting the demand for fuel additives from 2012 to 2017 pegs the US market for fuel additives at $1.2 billion in 2012, with volume demand exceeding 750 million pounds. It has estimated the growth rate to be 2.2% annually and mentioned Gasoline Detergents has been one of the most robust segments in the last decade. They also predict the market for Diesel Fuel additives is likely to grow the fastest in the next years.

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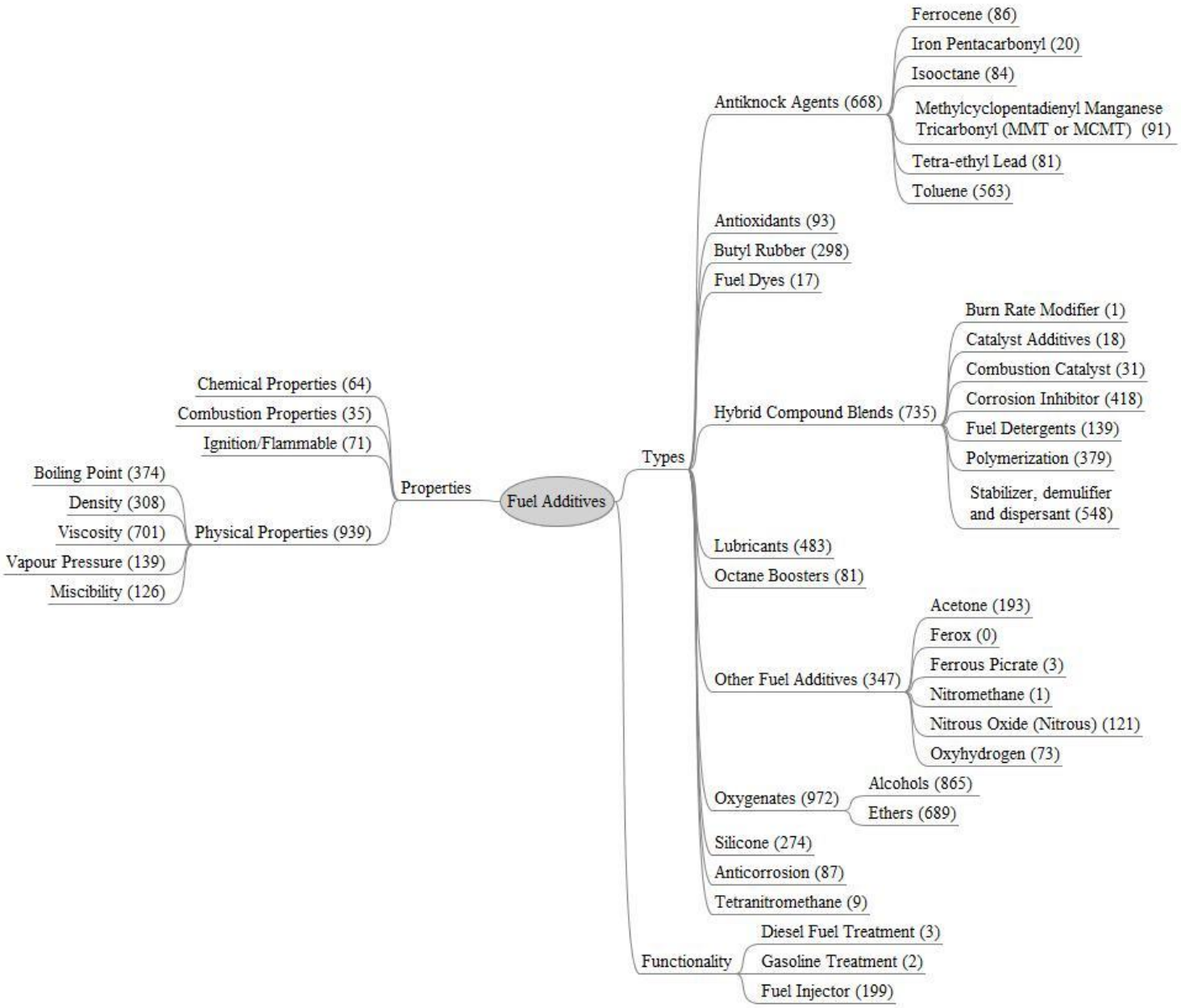
Categories of Fuel Additives

We categorized fuel additives along the following lines:

- Types of fuel additives
- Properties of fuel additives
- Application areas

The illustration below shows the different categories prepared and the number of records in each.



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Fuel Additives– Insights from Patents

Insight Overview

Fuel additives R&D combined by the wealth of information contained in the patents that have been filed under this technology over the past several decades can reveal more about this space. Analyzing these patents with the help of Patent iNSIGHT Pro software allows us to take a look into pattern of patent filings for fuel additives, an understanding of the categorization, applications and properties for various compounds that have been used as additives, uncover the top assignees and even look into the areas they are specifically been developing on.

The following are some insights generated through analysis of a patent set using the Patent iNSIGHT Pro software.

The Search Strategy

For this report to cover all types of fuel additives, we wanted the search to be broad. We decided not to use any keywords and combined IPC with US Classes to create a set of US records in this space. Using the commercial patent database PatBase as our data source we used the following search query to create our patent set.

IC – International Class
UC – US Class

((IC= ((C10L9/10 or C10L1/10))) and (UC= (44)))

The query was directed to search with the assumption that all related patents would be filed in US and the search was limited to US publications. The result was a patent set of 1315 records which would form the basis of our research.

Class Description:

C10L: FUELS NOT OTHERWISE PROVIDED FOR; NATURAL GAS; SYNTHETIC NATURAL GAS OBTAINED BY PROCESSES NOT COVERED BY SUBCLASSES C10G OR C10K; LIQUEFIED PETROLEUM GAS; USE OF ADDITIVES TO FUELS OR FIRES; FIRE-LIGHTERS

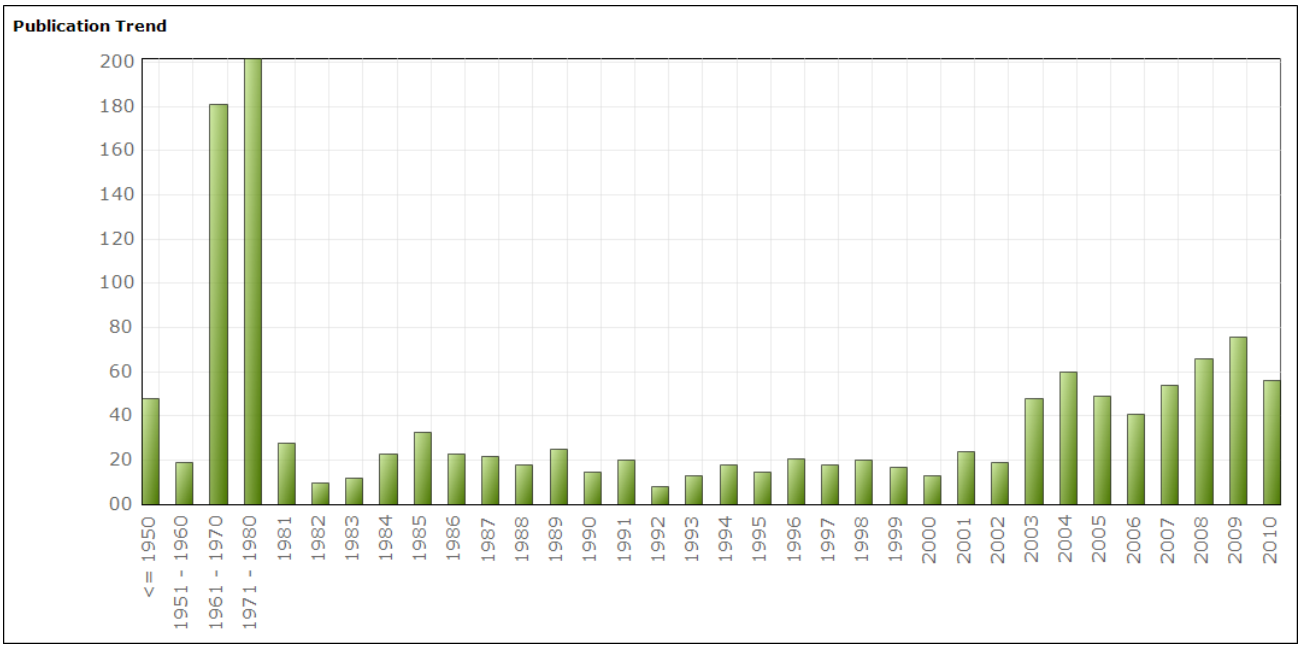
C10L9/10: by using additives

C10L1/10: containing additives

US Class 44: FUEL AND RELATED COMPOSITIONS

Publication Trend

What has been the IP publication trend for Fuel Additives?



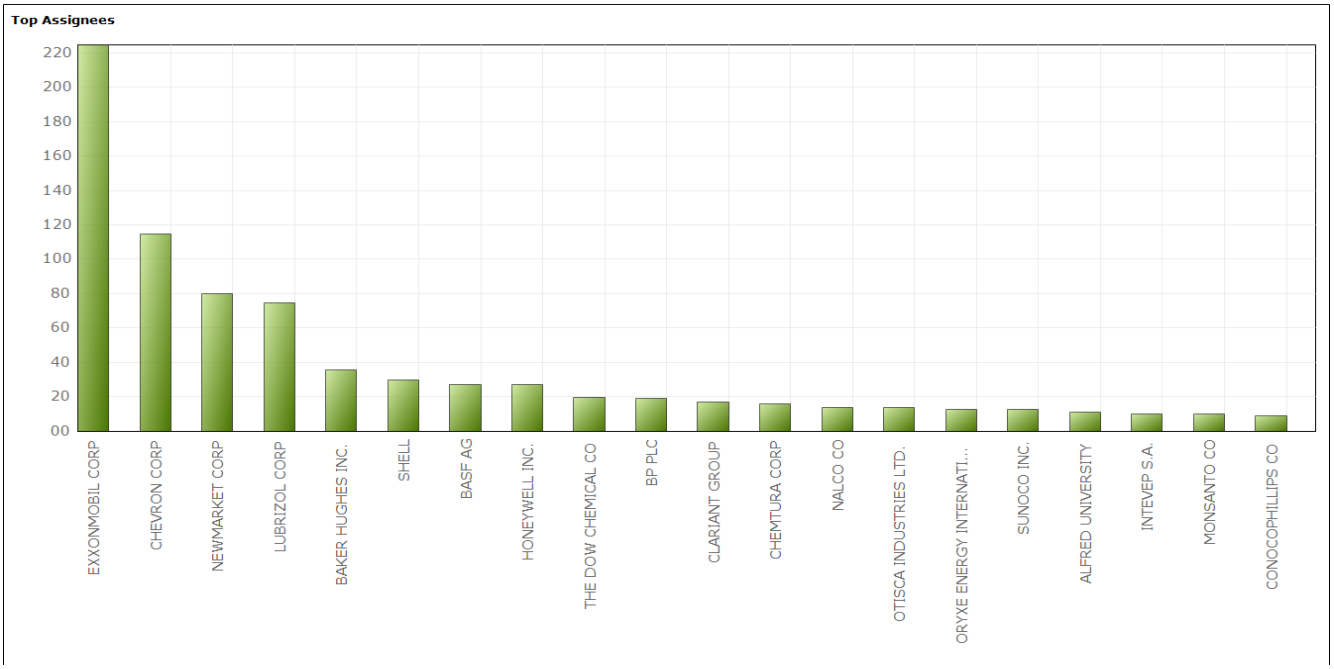
Research activity and patents related to Fuel additives can be traced back to before 1950. There has been steady work around this area throughout the last few decades but the real surge in the activity around this technology has happened in the last decade. The growing demand for fuel as well the global emphasis on reducing emissions and moving towards more efficient fuel usage may have contributed to this more recent growth in patent filings within this space.

How we did it?

Once the patents were populated in Patent iNSIGHT Pro, the publication trend chart was generated on a single click using the dashboard tool.

Top Assignees

Who have been the top assignees or the key players for fuel additive related patents?



The top assignees are:

1. EXXONMOBIL CORP
2. CHEVRON CORP
3. NEWMARKET CORP
4. LUBRIZOL CORP
5. BAKER HUGHES INC.
6. SHELL
7. BASF AG
8. HONEYWELL INC.
9. THE DOW CHEMICAL COM
10. BP PLC
11. Clariant Group
12. Chemtura Corp
13. Nalco CO
14. Otisca Industries Ltd
15. Oryxe Energy International
16. Sunoco Inc
17. Alfred University
18. Intevep SA
19. Monsanto CO
20. Conoco Phillips CO

How we did it?

Once the patents were populated in Patent iNSIGHT Pro, the assignee clean- up tools were used to normalize the names. Different cleanup tools were leveraged:

- To locate assignees for unassigned records
- To clean up records having multiple assignees
- To locate the correct assignee names for US records using the US assignments database
- To merge assignees that resulted from a merger or acquisition or name change.

Please refer Appendix A for more details on Assignee merging.

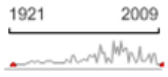
Once the Assignee names were cleaned up, the dashboard tool within Patent iNSIGHT Pro was used to find the top 20 assignees within the given patent set. A visual graph was created based on the results of the top assignees with the number of patents alongside each one.

The complete Assignee table in available in the following Excel file:

http://www.patentinsightpro.com/techreports/0910/List%20of%20Assignees.xls

Assignee - Key Statistics

Here we summarize key parameters of Top 15 Assignees such as filing trend, Avg. number of Forward citations per record, Top inventors in each Assignee, Top Co-Assignees and Coverage of underlying patent families

Assignee	Total No. of Records	Average No.of Fwd Cites per Patents	Filing Trend (Absolute)	Filing Year Range	Key Inventor (Top 5)	Co-Assignees	Coverage (Includes families)					
							US	EP	WO	JP	DE	GB
EXXONMOBIL CORP	225 (17.1%)	6.71		1929-2005	HORODYSKY ANDREW G(28) GUTIERREZ ANTONIO(21) BROIS STANLEY J(17) DONER JOHN P(12) BROIS STANLEY J(12)		287	61	26	101	61	40
CHEVRON CORP	115 (8.7%)	8.38		1931-2009	PLAVAC FRANK(11) WOLLENBERG ROBERT H(11) HARRISON JAMES J(9) O REAR DENNIS J(8) CHERPECK RICHARD E(6)	THE UNIVERSITY OF SOUTHERN MISSISSIPPI(1)	128	18	10	37	26	9
NEWMARKET CORP	80 (6.1%)	4.95		1954-2008	MALFER DENNIS J(11) COLUCCI WILLIAM J(10) ARADI ALLEN A(10) SCHWAB SCOTT D(7) ROOS JOSEPH W(7)		86	8	0	12	16	9
LUBRIZOL CORP	75 (5.7%)	10.36		1962-2007	LANGE RICHARD M(5) VARGO DANIEL M(5) DALY DANIEL T(5) DORER JR CASPER J(5) HAYASHI KATSUMI(5)		93	17	13	37	18	11
BAKER HUGHES INC.	36 (2.7%)	8.47		1954-1997	DICKSON WOODROW J(11) JENKINS FRED W(11) NAIMAN MICHAEL I(8) SCHIELD JOHN A(8) WEERS JERRY J(3)		32	2	0	0	0	0
SHELL	30 (2.3%)	4.63		1939-2005	JOHNSON THOMAS H(3) DIAMOND HYMAN(3) CALHOUN GEORGE M(3) LIN JIANG JEN(2) WANG PEN CHUNG(2)		37	5	4	3	12	12
BASF AG	27 (2.1%)	9.78		1962-2004	DEXTER MARTIN(6) GUENTHER WOLFGANG(5) SCHWAHN HARALD(5) OPPENLAENDER KNUT(4) RATH HANS PETER(4)		33	6	6	12	22	12
HONEYWELL INC.	27 (2.1%)	6.81		1927-2003	HENRYK A CYBA(7) CHENICEK JOSEPH A(6) ROSENWALD ROBERT H(4) CYBA HENRYK A(4) KWONG GARY(2)		44	0	0	0	3	2
THE DOW CHEMICAL CO	20 (1.5%)	7.55		1961-2005	BOLLINGER JOSEPH M(4) MACHLEDER WARREN H(4) SIMS HOMER J(2) BENNEVILLE PETER L DE(2) NORMAN A LEISTER(2)		25	0	0	7	11	10
BP PLC	19 (1.4%)	1.53		1978-2006	TAYLOR SPENCER EDWIN(4) HODGES MICHAEL(3) CLARKE MICHAEL J(2) WILSON MICHAEL JOHN(2) GOLDBATT IRWIN L(2)		14	6	6	7	5	11
CLARIANT GROUP	17 (1.3%)	0.94		2001-2006	KRULL MATTHIAS(16) REIMANN WERNER(6) HESS MARTINA(4) KUPETZ MARKUS(2) WILDFANG RAIMUND(2)		6	3	0	4	3	0
CHEMTURA CORP	16 (1.2%)	2.12		1965-2008	MUIR RONALD J(7) BYRON A HUNTER(3) GRABOWSKI WOJCIECH(3) HAUBRICHS ROLF(3) FOX E BRIAN(1)		4	0	0	0	2	3
NALCO CO	14 (1.1%)	4.93		1958-2008	TRAN BO L(6) PULLEN CAROL(3) PULLEN ERROLL M(3) CHAMOT WALTER M(2) PULLEN MELVYN D(2)		13	1	1	3	1	0
OTISCA INDUSTRIES LTD.	14 (1.1%)	6.14		1974-1980	SMITH CLAY D(8) KELLER JR DOUGLAS V(6) SMITH CLAY D(6) KELLER DOUGLAS V JR(4) KELLER JR D V(2)		18	0	0	0	2	2
ORYXE ENERGY INTERNATIONAL INC.	13 (1%)	0.69		2002-2004	JORDAN FREDERICK L(13) DOLBEAR GEOFFREY E(1)		0	0	0	0	0	0

How we did it?

In order to compress all the information into a single report, we used the new 360 ° series of reports available in the software. From the Assignee 360° report options, we selected the different pieces of information we wanted to include in the singular display and then ran the report. The generated report was then exported to Excel using the option provided for the same.

Inventor - Key Statistics

Here we summarize key parameters of Top 15 Inventors such as filing trend, average number of forward citations per record, key associated companies and top 5 co-inventors.

Inventor	Total No. of Records	Average No. of Fwd Cites per Patents	Filing Trend (Absolute)	Filing Year Range	Key Assignees (Top 5)	Co-Inventors
HORODYSKY ANDREW G	28 (2.1%)	5.64		1982-1995	EXXONMOBIL CORP(28)	DONER JOHN P(12) KELLER JR JOHN A(11) KAMINSKI JOAN M(3) KREMER ROSS A(2) WEI LIWEN(2)
GUTIERREZ ANTONIO	21 (1.6%)	6.14		1977-1997	EXXONMOBIL CORP(21)	BROIS STANLEY J(8) LUNDBERG ROBERT D(8) EMERT JACOB(3) KLEIST ROBERT A(3) SCHILOWITZ ALAN M(2)
BROIS STANLEY J	17 (1.3%)	10.18		1975-1991	EXXONMOBIL CORP(17)	GUTIERREZ ANTONIO(11) RYER JACK(4) MILLER HAROLD N(3) ZIELINSKI JAMES(3) FELDMAN NICHOLAS(1)
KRULL MATTHIAS	16 (1.2%)	0.94		2001-2006	CLARIANT GROUP(16)	REIMANN WERNER(6) HESS MARTINA(4) KUPETZ MARKUS(2) WILDFANG RAIMUND(2) COHRS CARSTEN(1)
JORDAN FREDERICK L	14 (1.1%)	0.64		2002-2004	ORYXE ENERGY INTERNATIONAL INC.(13) JORDAN FREDERICK L(1)	DOLBEAR GEOFFREY E(1)
BROIS STANLEY J	12 (0.9%)	3.75		1975-1990	EXXONMOBIL CORP(12)	GUTIERREZ ANTONIO(8) RYER JACK(4) MILLER HAROLD N(2) WINANS ESTHER(2) ZIELINSKI JAMES(2)
DONER JOHN P	12 (0.9%)	4.92		1984-1995	EXXONMOBIL CORP(12)	HORODYSKY ANDREW G(12) KELLER JR JOHN A(11) KELLER JOHN A(1)
LUNDBERG ROBERT D	12 (0.9%)	7.83		1983-1996	EXXONMOBIL CORP(12)	GUTIERREZ ANTONIO(8) DUVDEVANI ILAN(3) PEIFFER DENNIS G(3) PHILLIPS ROBERT R(2) BLOCH RICARDO(1)
DICKSON WOODROW J	11 (0.8%)	14.73		1960-1965	BAKER HUGHES INC.(11)	JENKINS FRED W(11)
GUTIERREZ ANTONIO	11 (0.8%)	7.45		1976-1991	EXXONMOBIL CORP(11)	BROIS STANLEY J(11) FELDMAN NICHOLAS(1)
JENKINS FRED W	11 (0.8%)	14.73		1960-1965	BAKER HUGHES INC.(11)	DICKSON WOODROW J(11)
KELLER JR JOHN A	11 (0.8%)	5.27		1984-1995	EXXONMOBIL CORP(11)	DONER JOHN P(11) HORODYSKY ANDREW G(11)
MALFER DENNIS J	11 (0.8%)	0.73		2001-2008	NEWMARKET CORP(11)	COLUCCI WILLIAM J(6) SCHWAB SCOTT D(4) ARADI ALLEN A(3) HOU PETER W(3) THOMAS MAY D(2)
PLAVAC FRANK	11 (0.8%)	15.64		1982-1995	CHEVRON CORP(11)	WOLLENBERG ROBERT H(7) BUCKLEY III THOMAS F(2) CAMPBELL CURTIS B(2) ERDMAN TIMOTHY R(2) SABOURIN EDWARD T(2)
SMITH CLAY D	11 (0.8%)	8.36		1974-1980	OTISCA INDUSTRIES LTD.(8) EXXONMOBIL CORP(3)	KELLER JR DOUGLAS V(9) KELLER JR D V(2)

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Fuel Additives - Properties vs. Types

What properties are used across different types of Fuel Additives? In the table below, Fuel additive types with higher number of patent filings have been highlighted with stronger shades of orange. One can see that many patents target the Viscosity of various fuel additives.

Properties (Column) / Types of Fuel Additives (Rows)	Total	Physical Properties						Ignition/Flammable	Combustion Properties	Chemical Properties
		Total	Boiling Point	Density	Viscosity	Vapour Pressure	Miscibility			
Total	912	902	365	300	680	135	124	66	35	59
Oxygenates	822	812	330	258	620	128	121	61	31	56
Alcohols	737	728	285	222	553	120	107	51	24	39
Ethers	597	590	257	160	476	89	95	42	17	37
Hybrid Compound Blends	651	643	254	189	539	89	78	34	25	35
Stabilizer, demulsifier and dispersant	508	500	194	133	433	75	57	33	20	23
Corrosion Inhibitor	376	370	164	96	323	62	48	25	14	16
Polymerization	356	352	136	76	311	38	32	6	12	17
Fuel Detergents	122	117	51	24	106	20	21	19	5	1
Combustion Catalyst	22	21	7	14	11	6	3	4	7	5
Catalyst Additives	17	16	6	8	13	2	5		4	4
Burn Rate Modifier	1	1		1	1					
Antiknock Agents	582	573	241	155	463	92	74	30	15	28
Toluene	501	493	207	126	416	71	69	25	10	26
Ferrocene	82	82	27	25	71	15	2	6	2	8
Isooctane	76	75	45	25	64	19	19	16	5	9
Methylcyclopentadienyl Manganese Tricarbonyl (MMT/MCMT)	72	70	49	19	49	22	18	14	7	1
Tetra-ethyl Lead	70	67	27	16	49	25	8	5	1	
Iron Pentacarbonyl	15	15	5	7	5	9	1	2	2	3
Lubricants	434	431	156	82	389	49	47	22	16	30
Other Fuel Additives	304	302	122	123	216	72	41	19	16	17
Acetone	167	166	57	48	136	34	16	4	2	10
Nitrous Oxide (Nitrous)	107	107	53	56	66	28	20	10	14	4
Oxyhydrogen	66	65	31	39	38	27	6	6	7	5
Ferrous Picrate	2	2	2	2	2	2		2	2	
Nitromethane	1	1		1	1					1
Butyl Rubber	285	282	93	55	270	28	40	21	2	11
Silicone	256	256	83	61	227	35	24	7	9	13
Antioxidants	85	85	28	19	74	30	9		1	4
Anticorrosion	75	74	29	26	57	19	7	2	4	1
Octane Boosters	72	72	51	31	43	39	24	20	8	7
Fuel Dyes	16	15	3	8	10	4	2	4	1	3
Tetranitromethane	7	6	2	2	6	2	1	3	2	1

How we did it?

We manually created categories of fuel additive types and properties. A two-level categorization was done in case of Properties. Then using the co-occurrence matrix, a map was generated for properties vs. types.

Fuel additive types vs Key Application Areas

How do various fuel additives compare across key application areas? For example, in the table below "Isooctane", "Ferrocene", "Tetra ethyl Lead" haven't been used in any of the Gasoline Treatment and Diesel Fuel Treatment.

Application Areas(Column) / Types (Rows)	Total	Fuel Injector Cleaner	Gasoline Treatment	Diesel Fuel Treatment
Total	197	193	2	3
Oxygenates	176	172	2	3
Alcohols	163	159	2	3
Ethers	143	141		3
Hybrid Compound Blends	152	148	2	3
Stabilizer, demulsifier and dispersant	119	117		3
Corrosion Inhibitor	100	100		1
Polymerization	52	52		1
Fuel Detergents	46	46		1
Combustion Catalyst	15	13	2	
Catalyst Additives	8	8		
Antiknock Agents	133	131	2	1
Toluene	99	97	2	1
Methylcyclopentadienyl Manganese Tricarbonyl (MMT/MCMT)	39	39		1
Isooctane	30	30		
Ferrocene	22	22		
Tetra-ethyl Lead	17	17		
Iron Pentacarbonyl	4	4		
Lubricants	85	85		
Other Fuel Additives	74	72		2
Nitrous Oxide (Nitrous)	53	51		2
Acetone	19	19		
Oxyhydrogen	17	17		
Ferrous Picrate	1	1		
Butyl Rubber	68	68		1
Silicone	39	39		
Octane Boosters	36	36		
Anticorrosion	29	29		1
Antioxidants	9	9		
Tetranitromethane	4	4		
Fuel Dyes	4	4		

How we did it?

The clusters of types and application areas that were created for the previous analysis were correlated using the co-occurrence analyzer and then the resulting matrix for converted into a chart and a heatmap.

The following table shows the same matrix, but with the companies behind the records. The "Show Data" option in the Co-occurrence Analyzer was used to Drill out the companies from the above matrix.

Application Areas (Columns) / Fuel Additive Types (Rows	Total	Fuel Injector Cleaner		Gasoline Treatment	Diesel Fuel Treatment
Total	80	78		1	2
Oxygenates	70	68		1	2
Alcohols	67	ADVANCED COMBUSTION TECHNOLOGIES INC ADVANCED LUBRICATION TECHNOLOGY INC AECI LTD AKZO NOBEL N.V AMYRIS BIOTECHNOLOGIES INC ARIZONA CHEMICAL CO BAKER HUGHES INC BASF AG BP PLC CAM TECHNOLOGIE S P A CARBOGEL JAPAN INC CERION TECHNOLOGY INC CHEVRON CORP CLEAN FUEL TECHNOLOGIES L L C CRAWFORD JAMES C CRAWFORD STEPHEN R DAIMLER AG DOBER CHEMICAL CORP DRESSER INC ENVIRONMENTAL AND ENERGY ENTPRISES LLC ETTER ROGER G EXXONMOBIL CORP FENTON RONALD L FLEETGUARD INC GE INFRASTRUCTURES INC GENERAL ELECTRIC COMPANY GIARDINO RADOSEVICH GERADELTE GO TEC INC H.E.W.D. ENTERPRISES-AMERICA LLC HIMMELSBACH HOLDINGS LLC INFINEUM INTERNATIONAL LTD INNOSPEC INC INSTITUT FRANCAIS DU PETROLE	JIMESON ROBERT M JORDAN FREDERICK L JX HOLDINGS INC KUHN GEORGE W LENLO CHEM INC LUBRIZOL CORP MAY WALTER R NALCO CO NANOCLUSTER TECHNOLOGIES LLC NASU HISAMOTO NEW GENERATION BIOFUELS INC NEWMARKET CORP OCTANE INTERNATIONAL LTD OESTE FRANZ DIETRICH OREAR DENNIS J ORYXE ENERGY INTERNATIONAL INC OSBORG HANS PTJ BIOENERGY HOLDING LTD PURE ENERGY CORP QUICKSILVER LTD RADOSEVICH MARK C SCHULZ JOHANN G SFA INTERNATIONAL INC SHAKUN WALLACE SHELL SIMPLE ENERGY SOLUTIONS INC STANDARD ALCOHOL CO OF AMERICA INC STEVENS REX R TALBERT FUEL SYSTEMS PATENTS CO TELLUS RENEWABLES LLC THE DOW CHEMICAL CO THE PENN STATE RESEARCH FOUNDATION	ADVANCED POWER SYSTEMS INTERNATIONAL INC.	AMERICAN ENERGY GROUP LTD CHEVRON CORP
Ethers	51	ADVANCED COMBUSTION TECHNOLOGIES INC ADVANCED LUBRICATION TECHNOLOGY INC AECI LTD AKZO NOBEL N.V AMYRIS BIOTECHNOLOGIES INC ARIZONA CHEMICAL CO BAKER HUGHES INC BASF AG BP PLC CAM TECHNOLOGIE S P A CARBOGEL JAPAN INC CERION TECHNOLOGY INC CHEVRON CORP DOBER CHEMICAL CORP DRESSER INC EXXONMOBIL CORP FLEETGUARD INC GE INFRASTRUCTURES INC GENERAL ELECTRIC COMPANY GIARDINO RADOSEVICH GERADELTE GO TEC INC H.E.W.D. ENTERPRISES-AMERICA LLC HIMMELSBACH HOLDINGS LLC IDEMITSU KOSAN CO. LTD INFINEUM INTERNATIONAL LTD	INSTITUT FRANCAIS DU PETROLE J T GRANATELLI LUBRICANTS INC JIMESON ROBERT M JORDAN FREDERICK L JX HOLDINGS INC LENLO CHEM INC LUBRIZOL CORP MAY WALTER R NEW GENERATION BIOFUELS INC NEWMARKET CORP OCTANE INTERNATIONAL LTD ORYXE ENERGY INTERNATIONAL INC OSBORG HANS PROCTER & GAMBLE CO PTJ BIOENERGY HOLDING LTD PURE ENERGY CORP RADOSEVICH MARK C SCHULZ JOHANN G SFA INTERNATIONAL INC SHELL SIMPLE ENERGY SOLUTIONS INC STANDARD ALCOHOL CO OF AMERICA INC STEVENS REX R THE DOW CHEMICAL CO THE PENN STATE RESEARCH FOUNDATION		AMERICAN ENERGY GROUP LTD CHEVRON CORP
Hybrid Compound Blends	56	148		1	2
Stabilizer, demulsifier and	43	IDEMITSU KOSAN CO. LTD			AMERICAN ENERGY GROUP LTD
Corrosion Inhibitor	35	INFINEUM INTERNATIONAL LTD			CHEVRON CORP
Polymerization	20	AKZO NOBEL N.V ARIZONA CHEMICAL CO BAKER HUGHES INC BASF AG BP PLC CAM TECHNOLOGIE S P A CHEVRON CORP DEMETER SYSTEMS LLC ENVIRONMENTAL AND ENERGY ENTPRISES LLC ETTER ROGER G	EXXONMOBIL CORP INFINEUM INTERNATIONAL LTD JX HOLDINGS INC LENLO CHEM INC LUBRIZOL CORP NEW GENERATION BIOFUELS INC NEWMARKET CORP OCTANE INTERNATIONAL LTD PTJ BIOENERGY HOLDING LTD THE DOW CHEMICAL CO		CHEVRON CORP
Fuel Detergents	14	AKZO NOBEL N.V BASF AG BREAKSPEAR ANGELA P CAPROTTI RINALDO CHEVRON CORP EXXONMOBIL CORP JORDAN FREDERICK L	NALCO CO NEWMARKET CORP ORYXE ENERGY INTERNATIONAL INC SHELL TELLUS RENEWABLES LLC THE DOW CHEMICAL CO THOMPSON RUSSELL M		CHEVRON CORP
Combustion Catalyst	13	CERION TECHNOLOGY INC CRAWFORD JAMES C CRAWFORD STEPHEN R DRESSER INC ENVIRONMENTAL AND ENERGY ENTPRISES LLC ETTER ROGER G	J T GRANATELLI LUBRICANTS INC MAY WALTER R NEWMARKET CORP OCTANE INTERNATIONAL LTD SFA INTERNATIONAL INC TELLUS RENEWABLES LLC	ADVANCED POWER SYSTEMS INTERNATIONAL INC.	
Catalyst Additives	6	CERION TECHNOLOGY INC ENVIRONMENTAL AND ENERGY ENTPRISES LLC ETTER ROGER G	LUBRIZOL CORP MAY WALTER R NEWMARKET CORP		

Antiknock Agents	52	51		1	1
Toluene	40	ADVANCED COMBUSTION TECHNOLOGIES INC ADVANCED LUBRICATION TECHNOLOGY INC AKZO NOBEL N.V ARIZONA CHEMICAL CO BAKER HUGHES INC BASF AG BP PLC BREAKSPEAR ANGELA P CAM TECHNOLOGIE S P A CAPROTTI RINALDO CERION TECHNOLOGY INC CHEVRON CORP CRAWFORD JAMES C CRAWFORD STEPHEN R DOBER CHEMICAL CORP ENCOTECH INC EXXONMOBIL CORP FLEETGUARD INC FORD MOTOR CO	GENERAL ELECTRIC COMPANY H.E.W.D. ENTERPRISES-AMERICA LLC INFINEUM INTERNATIONAL LTD INNOSPEC INC INSTITUT FRANCAIS DU PETROLE JORDAN FREDERICK L JX HOLDINGS INC LUBRIZOL CORP MASCHF AUGSBURG NUERNBERG AG NALCO CO NEW GENERATION BIOFUELS INC NEWMARKET CORP OCTANE INTERNATIONAL LTD ORYXE ENERGY INTERNATIONAL INC OSBORG HANS PROCTER & GAMBLE CO PTJ BIOENERGY HOLDING LTD SHELL THE DOW CHEMICAL CO THOMPSON RUSSELL M	ADVANCED POWER SYSTEMS INTERNATIONAL INC.	CHEVRON CORP
Isooctane	16	AMYRIS BIOTECHNOLOGIES INC CHEVRON CORP EXXONMOBIL CORP GIARDINO RADOSEVICH GERADELTE H.E.W.D. ENTERPRISES-AMERICA LLC HIMMELSBACH HOLDINGS LLC INNOSPEC INC JIMESON ROBERT M	JORDAN FREDERICK L NEWMARKET CORP OCTANE INTERNATIONAL LTD ORYXE ENERGY INTERNATIONAL INC RADOSEVICH MARK C STANDARD ALCOHOL CO OF AMERICA INC STEVENS REX R THE DOW CHEMICAL CO		
Tetra-ethyl Lead	15	CHEVRON CORP EXXONMOBIL CORP FORD MOTOR CO GIARDINO RADOSEVICH GERADELTE JIMESON ROBERT M JX HOLDINGS INC MAY WALTER R NEWMARKET CORP	RADOSEVICH MARK C SFA INTERNATIONAL INC SHELL SIMPLE ENERGY SOLUTIONS INC STANDARD ALCOHOL CO OF AMERICA INC STEVENS REX R THE DOW CHEMICAL CO		
Ferrocene	13	AMYRIS BIOTECHNOLOGIES INC BASF AG CRAWFORD JAMES C CRAWFORD STEPHEN R EXXONMOBIL CORP INNOSPEC INC MAY WALTER R NEWMARKET CORP	OCTANE INTERNATIONAL LTD OESTE FRANZ DIETRICH SFA INTERNATIONAL INC SIMPLE ENERGY SOLUTIONS INC THE PENN STATE RESEARCH FOUNDATION		
Methylcyclopentadienyl Manganese Tricarbonyl (MMT or MCMT)	12	AKZO NOBEL N.V CHEVRON CORP EXXONMOBIL CORP GIARDINO RADOSEVICH GERADELTE JIMESON ROBERT M JORDAN FREDERICK L	NEWMARKET CORP OCTANE INTERNATIONAL LTD ORYXE ENERGY INTERNATIONAL INC RADOSEVICH MARK C STANDARD ALCOHOL CO OF AMERICA INC STEVENS REX R		CHEVRON CORP
Iron Pentacarbonyl	4	EXXONMOBIL CORP NEWMARKET CORP	OCTANE INTERNATIONAL LTD OESTE FRANZ DIETRICH		
Other Fuel Additives	45	44			1
Nitrous Oxide (Nitrous)	36	AKZO NOBEL N.V BP PLC CAM TECHNOLOGIE S P A CERION TECHNOLOGY INC CHEVRON CORP CLEAN FUEL TECHNOLOGIES L L C DRESSER INC ENVIRONMENTAL AND ENERGY ENTPRISES LLC ETTER ROGER G EXXONMOBIL CORP FORD MOTOR CO GIARDINO RADOSEVICH GERADELTE GO TEC INC H.E.W.D. ENTERPRISES-AMERICA LLC HIMMELSBACH HOLDINGS LLC JIMESON ROBERT M JX HOLDINGS INC LUBRIZOL CORP MAY WALTER R	NANOCLUSTER TECHNOLOGIES LLC NEW GENERATION BIOFUELS INC NEWMARKET CORP OCTANE INTERNATIONAL LTD OESTE FRANZ DIETRICH ORYXE ENERGY INTERNATIONAL INC PROCTER & GAMBLE CO PTJ BIOENERGY HOLDING LTD PURE ENERGY CORP RADOSEVICH MARK C SFA INTERNATIONAL INC STANDARD ALCOHOL CO OF AMERICA INC STEVENS REX R SYRACUSE UNIVERSITY TALBERT FUEL SYSTEMS PATENTS CO THE PENN STATE RESEARCH FOUNDATION		AMERICAN ENERGY GROUP LTD.
Acetone	13	ADVANCED LUBRICATION TECHNOLOGY INC AECI LTD AKZO NOBEL N.V AMYRIS BIOTECHNOLOGIES INC EXXONMOBIL CORP GO TEC INC H.E.W.D. ENTERPRISES-AMERICA LLC	INNOSPEC INC JX HOLDINGS INC OCTANE INTERNATIONAL LTD SCHULZ JOHANN G SHELL SIMPLE ENERGY SOLUTIONS INC		
Oxyhydrogen	11	AMYRIS BIOTECHNOLOGIES INC BIDWELL HOWARD BP PLC CARBOGEL JAPAN INC DRESSER INC ENVIRONMENTAL AND ENERGY ENTPRISES LLC	ETTER ROGER G EXXONMOBIL CORP JX HOLDINGS INC NANOCLUSTER TECHNOLOGIES LLC SHELL		

Ferrous Picrate	1	OCTANE INTERNATIONAL LTD.			
Lubricants	38	ADVANCED LUBRICATION TECHNOLOGY INC AECI LTD AKZO NOBEL N.V ARIZONA CHEMICAL CO BAKER HUGHES INC BASF AG BIDWELL HOWARD CAM TECHNOLOGIE S P A CERION TECHNOLOGY INC CHEVRON CORP CLEAN FUEL TECHNOLOGIES L L C COGNIS EXXONMOBIL CORP GE INFRASTRUCTURES INC GIARDINO RADOSEVICH GERADELTE GO TEC INC H.E.W.D. ENTERPRISES-AMERICA LLC HIMMELSBACH HOLDINGS LLC	J T GRANATELLI LUBRICANTS INC JIMESON ROBERT M LENLO CHEM INC LUBRIZOL CORP NEW GENERATION BIOFUELS INC NEWMARKET CORP OCTANE INTERNATIONAL LTD OREAR DENNIS J OSBORG HANS PTJ BIOENERGY HOLDING LTD RADOSEVICH MARK C SCHULZ JOHANN G SHELL SIMPLE ENERGY SOLUTIONS INC STANDARD ALCOHOL CO OF AMERICA INC STEVENS REX R TALBERT FUEL SYSTEMS PATENTS CO TELLUS RENEWABLES LLC THE DOW CHEMICAL CO THE PENN STATE RESEARCH FOUNDATION		
Silicone	22	ADVANCED LUBRICATION TECHNOLOGY INC ARIZONA CHEMICAL CO BP PLC CERION TECHNOLOGY INC CLEAN FUEL TECHNOLOGIES L L C DEMETER SYSTEMS LLC DOBER CHEMICAL CORP ENVIRONMENTAL AND ENERGY ENTPRISES LLC ETTER ROGER G EXXONMOBIL CORP FLEETGUARD INC	GENERAL ELECTRIC COMPANY H.E.W.D. ENTERPRISES-AMERICA LLC IDEMITSU KOSAN CO. LTD INNOSPEC INC JX HOLDINGS INC LENLO CHEM INC LUBRIZOL CORP NEW GENERATION BIOFUELS INC OCTANE INTERNATIONAL LTD OESTE FRANZ DIETRICH PTJ BIOENERGY HOLDING LTD.		
Octane Boosters	21	ADVANCED COMBUSTION TECHNOLOGIES INC AMYRIS BIOTECHNOLOGIES INC CERION TECHNOLOGY INC CHEVRON CORP EXXONMOBIL CORP GIARDINO RADOSEVICH GERADELTE H.E.W.D. ENTERPRISES-AMERICA LLC HIMMELSBACH HOLDINGS LLC JIMESON ROBERT M JORDAN FREDERICK L JX HOLDINGS INC	LENLO CHEM INC MAY WALTER R OCTANE INTERNATIONAL LTD ORYXE ENERGY INTERNATIONAL INC PROCTER & GAMBLE CO RADOSEVICH MARK C SFA INTERNATIONAL INC SIMPLE ENERGY SOLUTIONS INC STANDARD ALCOHOL CO OF AMERICA INC STEVENS REX R		
Butyl Rubber	19	AMYRIS BIOTECHNOLOGIES INC ARIZONA CHEMICAL CO BREAKSPEAR ANGELA P CAPROTTI RINALDO CHEVRON CORP DOBER CHEMICAL CORP EXXONMOBIL CORP FLEETGUARD INC HIMMELSBACH HOLDINGS LLC INFINEUM INTERNATIONAL LTD	JORDAN FREDERICK L JX HOLDINGS INC LUBRIZOL CORP NEWMARKET CORP OCTANE INTERNATIONAL LTD ORYXE ENERGY INTERNATIONAL INC SHELL THE DOW CHEMICAL CO THOMPSON RUSSELL M		CHEVRON CORP
Anticorrosion	11	AMYRIS BIOTECHNOLOGIES INC BP PLC CHEVRON CORP CLEAN FUEL TECHNOLOGIES L L C EXXONMOBIL CORP GE INFRASTRUCTURES INC	INNOSPEC INC LENLO CHEM INC NEWMARKET CORP OSBORG HANS SHELL		CHEVRON CORP
Antioxidants	6	BP PLC GE INFRASTRUCTURES INC INNOSPEC INC	LUBRIZOL CORP OSBORG HANS SHELL		
Tetranitromethane	4	LUBRIZOL CORP NEW GENERATION BIOFUELS INC	OCTANE INTERNATIONAL LTD PTJ BIOENERGY HOLDING LTD.		
Fuel Dyes	4	EXXONMOBIL CORP LUBRIZOL CORP	NEW GENERATION BIOFUELS INC PTJ BIOENERGY HOLDING LTD.		

Patent iNSIGHT Pro
Transform Patents to Intelligence

Fuel Additive Technologies across key companies

The matrix highlights the focus areas within fuel additives being pursued by key companies.

From below matrix one can see that ExxonMobil has a significant number of patents for Hybrid Compound Blends, Oxygenates, and Antiknock agents. NewMarket Corp has an edge when it comes to Methylcyclopentadienyl Manganese Tricarbonyl (MMT or MCMT) type of fuel additives with maximum records in the category.

	Types																														Properties								Application Areas		
						Hybrid Compound Blends								Oxygenates			Antiknock Agents							Other Fuel Additives											Physical Properties									
Assignee	Octane Boosters	Lubricants	Silicone	Butyl Rubber	Tetranitromethane	Total	Burn Rate Modifier	Catalyst Additives	Combustion Catalyst	Corrosion Inhibitor	Fuel Detergents	Polymerization	Stabilizer, demulsifier and dispersant	Total	Alcohols	Ethers	Total	Ferrocene	Iron Pentacarbonyl	Isooctane	Methylcyclopentadienyl Manganese Tricarbonyl	Tetra-ethyl Lead	Toluene	Fuel Dyes	Total	Acetone	Ferox	Ferrous Picrate	Nitromethane	Nitrous Oxide (Nitrous)	Oxyhydrogen	Antioxidants	Anticorrosion	Ignition/Flammable	Combustion Properties	Total	Boiling Point	Density	Miscibility	Vapour Pressure	Viscosity	Chemical Properties	Gasoline Treatment	Fuel Injector Cleaner	Diesel Fuel Treatment
EXXONMOBIL CORP	15	138	88	111	0	144	0	4	0	84	15	71	113	190	163	143	143	43	1	20	1	5	135	2	54	47	0	0	0	4	3	11	23	3	2	189	65	24	27	10	165	10	0	20	0
CHEVRON CORP	7	48	6	42	0	78	0	0	0	44	46	60	65	91	80	60	87	1	3	10	23	28	76	1	18	12	0	0	0	2	4	14	10	0	2	87	40	9	3	15	65	1	0	19	1
NEWMARKET CORP	0	21	8	18	0	46	0	2	2	33	19	17	30	52	47	43	58	7	1	2	40	1	32	0	15	9	0	0	0	5	5	2	7	1	3	39	24	8	5	4	28	2	0	30	0
LUBRIZOL CORP	0	66	42	40	6	74	0	2	0	52	7	58	68	75	75	74	71	0	0	10	2	7	67	1	38	29	0	0	0	8	1	24	5	4	2	71	24	0	1	14	68	1	0	7	0
BAKER HUGHES INC.	0	10	2	0	0	29	0	0	0	23	0	22	14	31	28	27	22	0	0	0	0	1	22	0	5	5	0	0	1	0	0	4	2	1	0	25	14	12	1	1	23	1	0	2	0
SHELL	1	7	2	11	0	14	0	1	1	10	5	2	7	13	12	11	12	0	0	1	1	5	8	1	4	2	0	0	0	1	1	4	4	0	1	16	8	6	6	3	13	0	0	9	0
HONEYWELL INC.	0	12	2	2	0	22	0	0	0	16	6	16	21	22	18	21	15	3	0	3	0	0	10	0	2	2	0	0	0	0	0	1	0	0	0	15	1	3	2	2	13	0	0	5	0
BASF AG	0	3	7	4	0	12	0	0	0	11	0	6	9	13	9	12	13	0	0	2	0	1	12	0	5	4	0	0	0	0	1	0	0	0	1	13	5	5	0	1	6	3	0	0	0
THE DOW CHEMICAL CO	0	10	6	6	0	13	0	0	0	7	4	10	11	16	15	10	11	0	0	2	0	3	11	1	3	3	0	0	0	0	0	5	3	3	0	8	1	1	1	0	7	0	0	3	0
BP PLC	0	4	5	2	0	13	0	0	0	8	4	3	10	14	8	10	11	0	1	0	0	0	10	0	3	0	0	0	0	3	3	3	3	0	1	18	13	11	0	6	10	0	0	5	0
CLARIANT GROUP	0	11	1	7	0	17	0	0	0	17	0	16	17	17	17	17	16	0	0	0	0	0	16	0	6	6	0	0	0	0	0	0	0	0	0	17	12	13	2	0	13	0	0	0	0
CHEMTURA CORP	0	10	12	10	0	14	0	0	0	9	0	8	14	16	15	16	11	0	0	0	0	0	11	0	3	0	0	0	0	0	3	7	1	0	0	15	0	2	2	0	13	0	0	0	0
NALCO CO	0	0	1	0	0	2	0	0	0	1	1	1	1	12	9	4	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	6	4	1	0	0	5	0	0	1	0
OTISCA INDUSTRIES	0	10	0	0	0	0	0	0	0	0	0	0	0	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	14	13	10	10	1	14	10	0	0	0
ORYXE ENERGY INTERNATIONAL INC.	11	0	0	11	0	12	0	0	0	12	11	0	12	13	12	11	13	0	0	11	11	0	13	0	4	0	0	0	0	4	0	0	0	11	1	11	11	7	11	7	11	0	0	11	0

How we did it?

We used the categories created and using the Assignee 360° report option, we selected the categories we wanted to include in the singular display and then ran the report. The generated report was then exported to Excel using the option provided.

Appendix A: Key Assignee Normalization Table

EXXONMOBIL CORP
BRONS CORNELIUS H
BROWN LEO D
SISKIN MICHAEL
VARADARAJ RAMESH
STANDARD OIL CO
SOCCNY VACUUM OIL COMPANY INC
SOCONY VACUUM OIL CO INC
STANDARD OIL DEV CO
EXXON RESEARCH ENGINEERING CO
SOCONY MOBIL OIL CO INC
MOBIL OIL CORP
MOBIL CORP
STANDARD OIL CO OHIO
EXXON CHEMICAL PATENTS INC
EXXONMOBIL RES AND ENG CO
EXXONMOBILE RES AND ENGINEERIN

CHEVRON CORP
CHEVRON USA INC
HAYDEN THOMAS E
THIEL C Y
MILLER STEPHEN J
O REAR DENNIS J
CHAU ANGELA
O REAR DENNNIS J
CHEVRON ORONITE CO
TEXAS CO
GULF OIL CORP
GULF RESEARCH DEVELOPMENT CO
TEXACO INC
CHEVRON RES
UNION OIL CO
UNION OIL COMPANY OF COMPANY
CHEVRON RES AND TECH
CHEVRON CHEM CO
TEXACO DEVELOPMENT CORP
CHERVON U S A INC
CHEVRONTEXACO JAPAN LTD
UNIV SOUTHERN MISSISSIPPI
CHEVRON ORONITE CO LLC

NEWMARKET CORP
COLUCCI WILLIAM
FRICKE KYLE
SAMSUNG ELECTRONICS CO LTD
DEVLIN MARK T
GUINTHER GREGORY H
HUMAN DAVID M
ROOS JOSEPH W
AFTON CHEMICAL CORP
ARADI ALLEN A
RAINEAR DENNIS H

ETHYL CORP
STANDARD OIL CO
STANDARD OIL CO INDIANA
AFTON CHEMICAL INTANGIBLES LLC
AFTON CHEMICAL INTANGIBLES

LUBRIZOL CORP
LUBRIZOL CORP A CORP OF THE ST
BROWN KEVIN F
DUNCAN DAVID A
LANGER DEBORAH A
TADROUS TED N
BARBOUR ROBERT H
MORETON DAVID J
BAKER MARK R
BARR DOUGLAS M
DALY DANIEL T
DI BIASE STEPHEN A
FILIPPINI BRIAN B
MULLAY JOHN J
STECKEL THOMAS F
WESTFALL DAVID L
BARTLEY STUART L
HOBSON DAVID M
CHAMBERLIN WILLIAM B III
PUDELSKI JOHN K
SPIVEY DAVID L
LUBRIZOL CORP
DORER JR CASPER J
HAYASHI KATSUMI

BAKER HUGHES INC.
PETROLITE CORP
BAKER HUGHES INC

SHELL
CLAYTON CHRISTOPHER W
DAHLSTROM MARY A
LEE GEORGE R
PRICE RICHARD J
SMITH SUSAN J
TAIT NIGEL P
WALLINGTON JESSICA F
SHELL DEV
SHELL OIL CO

HONEYWELL INC.
UNIVERSAL OIL PROD CO
UOP INC
UOP LLC

BASF AG
GANDE MATTHEW E
GATECHAIR LESLIE R

VENKATADRI RAMRAJ
WAYNICK ANDREW
WESTBROOK STEVE
BASF AG
GEIGY CHEM CORP
CIBA GEIGY CORP
BASF WYANDOTTE CORP

THE DOW CHEMICAL CO
UNION CARBIDE COMPANY
ROHM AND HAAS
DOW CHEMICAL CO
UPJOHN CO

BP PLC
FORD ANTHONY S
MITCHELL JAMES A
TAYLOR SPENCER E
JOSEPH JOSEPH T
MILLER JAMES R
WINWARD MICHAEL R
ZHANG TIEJUN
BP CORP NORTH AMERICA INC
ATLANTIC RICHFIELD CO
BP CHEMICALS ADDITIVES
BP OIL INT
CASTROL LTD
BP CORPORATION NORTH AMERICA INC.

Appendix B: Search Strings Used for Categorization

Categorization: Types of fuel additives

1. Oxygenates

Oxygenates	
(methanol or ethanol or n-butanol or t-butanol or (Isopropyl w/3 alcohol)) or IPA or MeOH or EtOH or BuOH or GTBA	686 results
(methanol or ethanol or n-butanol or t-butanol or (Isopropyl w/3 alcohol)) or (IPA or MeOH or EtOH or BuOH or GTBA) or alcohol	865 results
oxygenate*	972 results

2. Hybrid Compound Blends

Hybrid Compound Blends	
Burn rate modifier	1 result
catalyst* w/3 additive*	18 results
combust* w/3 catalyst*	31 results
corrosion* w/3 inhibit*	418 results

3. Lubricants

Lubricants	
Lubricant*	483 results

4. Other Fuel Additives

Other Fuel Additives	
acetone*	193 results
Ferrous w/5 Picrate*	3 results
Picrate*	3 results
Nitro w/3 methane*	1 result
aclm contains nitrous w/3 oxide	2 results
(nitrous w/3 oxid*) or NOX	121 results
Oxy* w/3 hydrogen*	73 results

5. Butyl Rubber

Butyl Rubber	
polyisobutylene*	292 results
butyl* w/3 rubber*	298 results

6. Silicone

Silicone	
silicon*	274 results
ttl to spec contains) silicon*	25 results

7. Octane Boosters

Octane Boosters	
(octane w/3 booster*) or MTBE or ETBE	81 results

8. Anticorrosion

Anticorrosion	
Anti* w/3 corrosion*	87 results

9. Antioxidants

Antioxidants	
Anti* w/3 oxidant*	93 results

10. Tetranitromethane

Tetranitromethane	
Tetranitromethane* or TNM	9 results

11. Fuel Dyes

Fuel Dyes	
fuel w/3 dye*	5 results
dye* w/3 (color* or colour*)	14 results
dye* w/3 (color* or colour*) or (fuel w/3 dye*)	17 results

12. Antiknock Agents

Antiknock Agents	
Ferrocene*	82 results
Ferrocen*	86 results
Iron w/3 (pentacarbonyl* or carbonyl*)	24 results
2,2,4-Trimethylpentane* or (iso w/3 octane or neopentylpropane)	18 results
2,2,4-Trimethylpentane*	8 results
iso w/3 octane*	10 results
isooctane*	84 results
(Methylcyclopentadienyl Manganese Tricarbonyl*) or (MMT or MCMT)	72 results
manganese w/3 tricarbonyl*	91 results
(tetraethyl w/3 lead) or TEL	81 results
toluene* or toluol*	563 results
antiknock* w/3 agent*	668 results
(anti w/3 knock*) w/3 agent*	56 results

Categorization: Properties of fuel additives

1. Physical Properties

Physical Properties	
physic* w/3 propert*	146 results
(vapour* or vapor) w/3 pressur*	139 results
Boiling w/3 point*	374 results
miscibili* or miscib*	126 results
Densit*	308 results
Viscosit*	701 results

2. Ignition/ Flammability

Ignition/ Flammability	
Igntion*	315 results
Flammab*	70 results

3. Combustion Property

Combustion Property	
Combust* w/3 propert*	35 results

4. Chemical Property

Chemical Property	
chemic* w/3 propert*	64 results

Categorization: Application areas

1. Fuel Injector

Fuel Injector	
fuel* w/3 inject*	199 results

2. Gasoline Treatment

Gasoline Treatment	
gasolin* w/3 (treat* or clean)	44 results
gasolin* w/3 (treatment or clean)	15 results

3. Diesel Fuel Treatment

Diesel Fuel Treatment	
(diesel w/3 fuel*) w/2 (treat* or clean)	42 results
(diesel w/3 fuel*) w/3 (treatment or clean)	11 results

Summary

Fuel Additives patents can be traced back to the 1950's and research and development around newer types and application areas of has been steady over 5 decades only witnessing a quicker growth in the most recent decade. Companies such as Exxon Mobil, Chevron and NewMarket Corp have been amongst the leaders in this field with the largest patent portfolios in the fuel additives market although Exxon Mobil's patent holdings are significantly higher than the other key assignees. Patent data reveals various organizations have focused their research across different categories and application areas of additives with some working on the cleaning properties, some on the anti oxidation properties and others having more research around catalysts. With the emphasis on improving on fuel usage, lowering emissions and utilizing fossil fuels more efficiently in the recent years coupled with the growth estimates of the fuel additives market this is still currently a growing technology we can expect to see more from in the years to come.

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Sources & References

- http://en.wikipedia.org/wiki/Gasoline_additive
- http://www.epa.gov/oms/regs/fuels/diesel/diesel.htm
- http://peswiki.com/index.php/Directory:Fuel_Efficiency_Additives
- http://www.autotropolis.com/wiki/index.php?title=Fuel_Additives:_The_Real_Story
- http://www.bharatbook.com/Market-Research-Reports/Specialty-Fuel-Additives-forecasts-to-2012-and-2017.html
- http://www.alternative-energy-news.info/technology/biofuels/ethanol-fuel/