



Coordinating Research Council

# CRC Background

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Coordinating Research Council, Inc.  
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**CRC Workshop on Life Cycle Analysis of  
Transportation Fuels**

Argonne National Laboratory  
Argonne, IL

**October 27, 2015**

# Introduction

- Transportation equipment and fluids have to work together
- Transportation fuels have been developed in parallel with other technologies
- Cooperative research model developed early in the 20<sup>th</sup> Century
- Stakeholder collaboration still essential

# CRC Charter

- CRC's objective, as stated in our charter, is:

“To encourage and promote the arts and sciences by directing scientific cooperative research in developing the best possible combinations of fuels, lubricants, and the equipment in which they are used, and to afford means of cooperation with the Government on matters of national interest within this field.”

# 1903 – The Wright Brothers

- 4.4:1 compression ratio & about 1200 rpm
- 12 hp
- Fuel tank – half-gallon gravity feed
- Fuel distilled from Pennsylvania crude oil
- Octane number estimated to be 38



# The Coordinating Research Council

- Started in 1919 as an SAE committee (CFR)
- Became independent organization in 1942
- Environmental research started in the 1950's
  - Air Pollution Research Advisory Committee in 1968
  - Auto/Oil in 1989
  - Post-Auto/Oil programs beginning in 1996

# SAE Paper 881609

by Gilbert Way of Ethyl Corp and Member of Desert Rats

The records show that the first Camp Seeley project was accomplished in an unbelievably short period:

- ✓ June 8, 1942 approved of project and organization of test team at CRC offices in New York
- ✓ June 16 start of ONR road tests at Camp Seeley
- ✓ July 7 summary tabulations of all ONR and spark timing investigations
- ✓ July 10 completion of vapor lock testing including fuel system modifications with fuel test samples still being inspected at San Bernardino
- ✓ July 20 Restricted CRC Report “Fuel Octane Number and Vapor Pressure Requirements of Quartermaster Motor Vehicles in Desert Operation” completed (CRC No. 126)

# SAE Paper 881609 – *Continued*

by Gilbert Way of Ethyl Corp and Members of Desert Rats



Fig. 15      M4-A1 Tank on Vapor Lock Test Course



# SAE Paper 881609 – *Continued*

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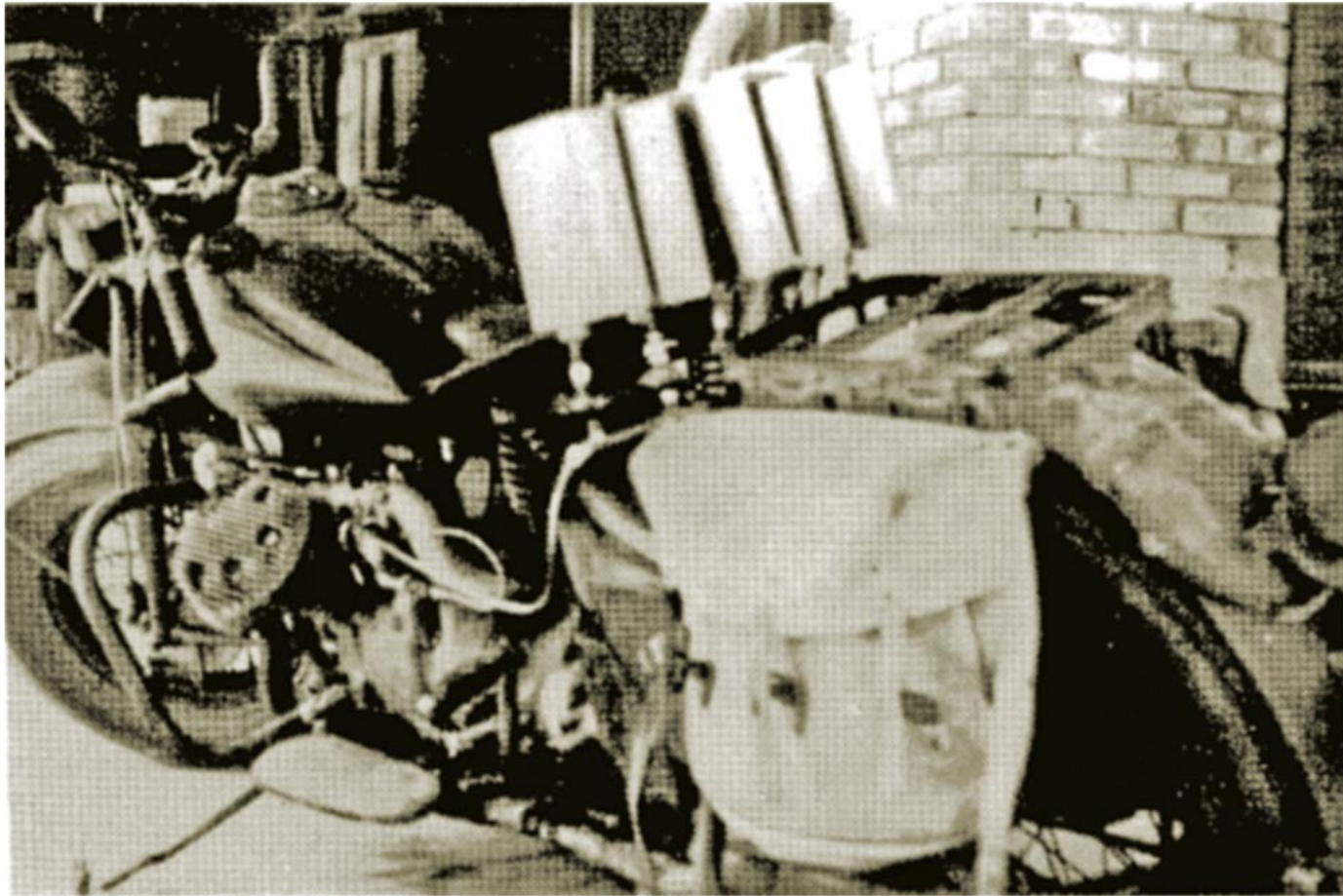


Fig. 7 QMC Motorcycle with Reference Fuel Cans for ONR Tests



# 1931 – CFR Committee



Cooperative fuel research committee members representing:

- Atlantic Refining Co.
- Ethyl Gasoline Co.
- General Motors
- National Bureau of Standards
- Sinclair Refining, Co.
- Standard Oil of Indiana
- The Texas Co.
- University of Pittsburgh
- Waukesha Motor Co.
- Yale University

# 2015 – LCA Workshop

## Organizing Committee

Members representing:

- EPA – Vince Camobreco
- RFA – Geoff Cooper
- Ford - Robert De Kleine
- U of MI – John DeCicco
- USDA – James Duffield
- ExxonMobil – Jeff Farenback-Brateman
- CONCAWE – Heather Hamje
- SCAQMD – Henry Hogo
- Phillips 66 - Amit Kapur
- EPA – Robert Larsen
- API – David Lax
- JRC – Luisa Marelli
- UCS – Jeremy Martin
- NRCan – Devin O’Grady
- NBB – Don Scott
- Marathon Petr. – Dan Short
- Chevron – Laura Verduzco
- Argonne NL – Michael Wang

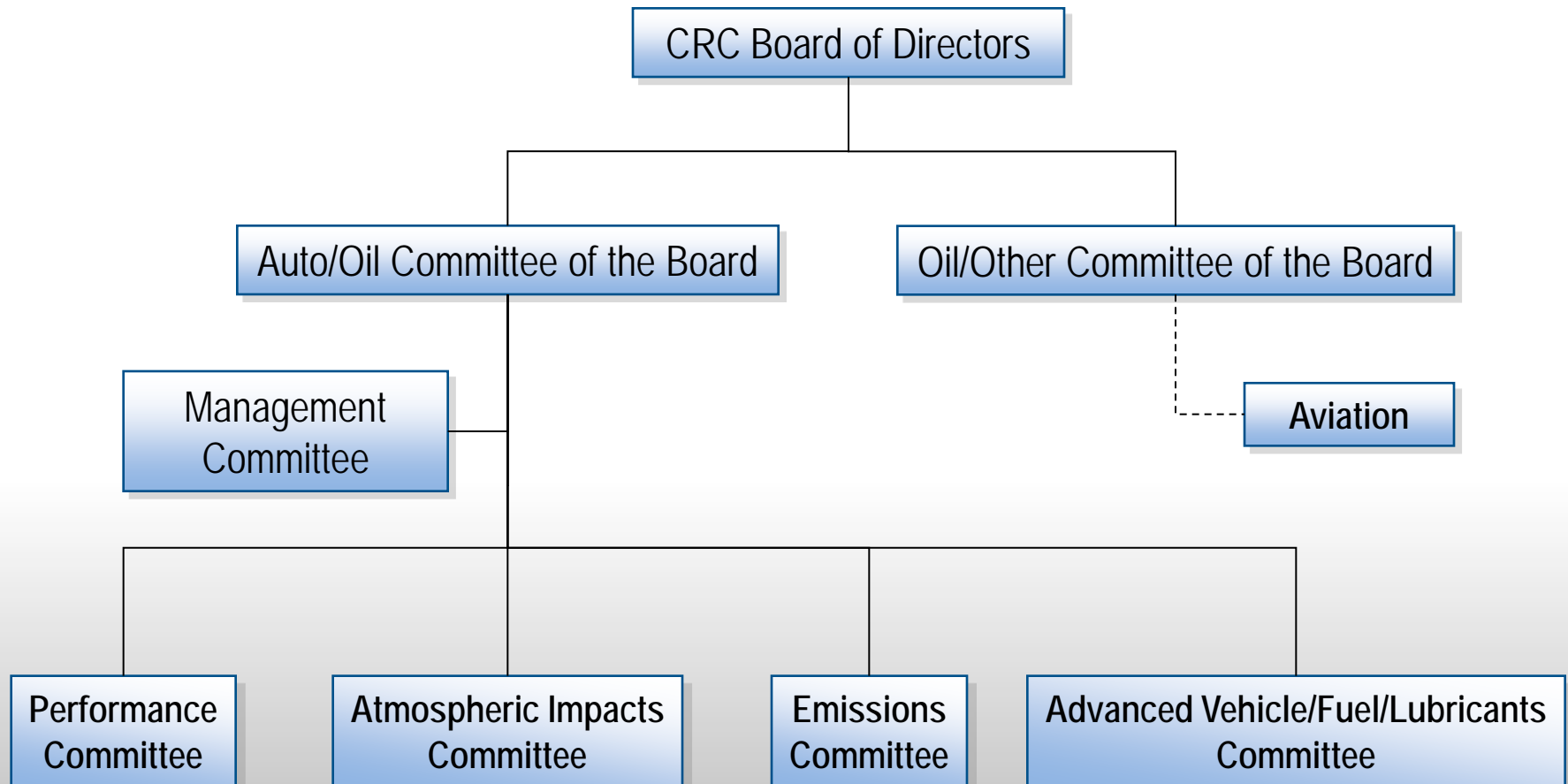
# 2015 LCA Workshop Sponsors

- API
- Argonne National Laboratory
- CONCAWE
- Canadian Fuels Association
- National Biodiesel Board
- Renewable Fuels Association
- SCAQMD
- USDA
- University of MI Energy Institute

CRC Website

[www.crcao.org](http://www.crcao.org)

# CRC Organization



# More about CRC History



# SAE Paper 881609

by Gilbert Way of Ethyl Corp and Member of Desert Rats

**Abstract** – Liaison between the Coordinating Research Council (CRC) and the Military Forces began before World War II.

- It was implemented when an M3-A3 light tank was shipped to San Bernardino, California to participate in the Road Test Program in 1942
- CRC organized test teams to study problems in operations under extreme ambient conditions that were related to fuels and lubricants.
- The CRC War Advisory Committee was formed about the same time...

# CRC War Committee



# SAE Paper 881609 – *Continued*

by Gilbert Way of Ethyl Corp and Members of Desert Rats

- CRC was able to implement the war-time programs without delay because of the large-scale centralized CFR road knock tests conducted at Uniontown, Pennsylvania in 1932 and 1934.
- The CRC test teams were composed of the same people so the machinery was already in place for rapid mobilization.
- Early in 1942, Earl Bartholomew, Director of Ethyl's Research Laboratories, made a visit to Camp Young located in the California Desert — here General Patton was training the 7<sup>th</sup> Armored Division for anticipated desert warfare in North Africa — and shortly thereafter set in motion the first CRC wartime test program at Camp Seeley.

# SAE Paper 881609 – *Continued*

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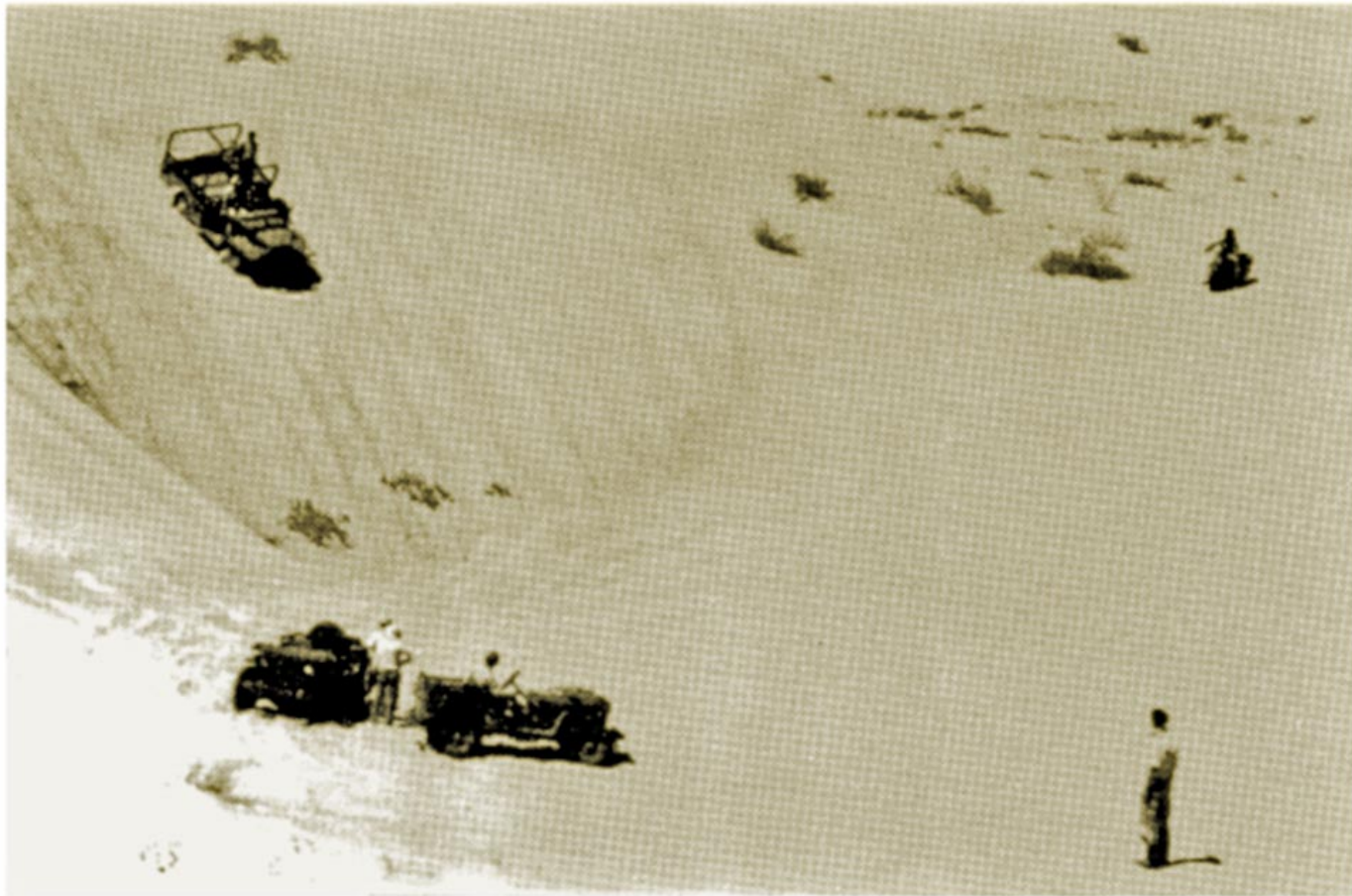


Fig. 4 Yuma Sand Dunes and QMC Vehicles

# Early Vehicle Emissions Program – *Continued*

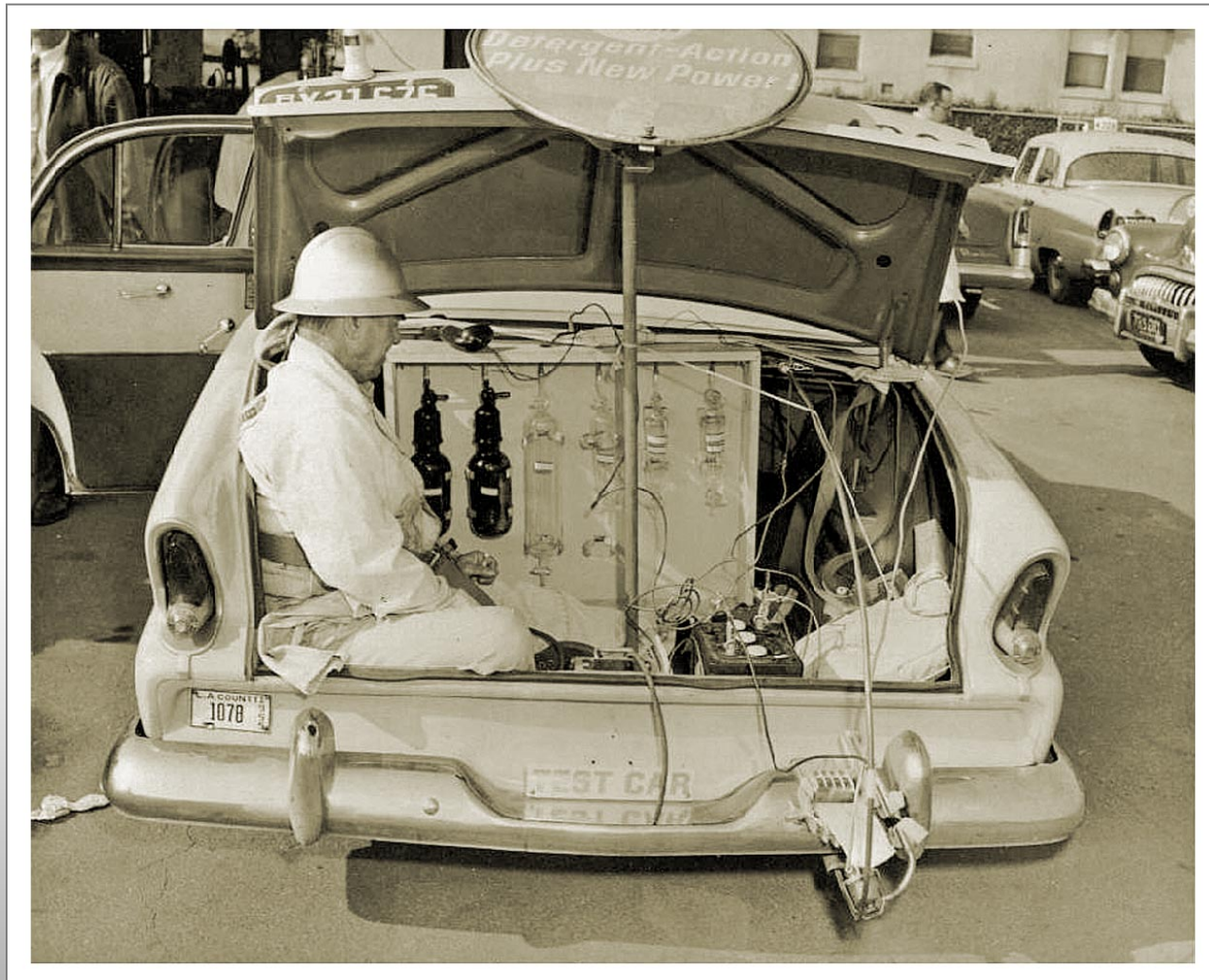
## The CRC 1955 Los Angeles Riverbed Study

- Preliminary Study developed and tested new measurement techniques for HC, CO, CO<sub>2</sub>, and NOx (293 vehicles)
- Liston-Becker 15 and 28 Model spectrometers used to measure HC, CO and CO<sub>2</sub>



# Early Vehicle Emissions Program – *Continued*

## The CRC1955 Los Angeles Riverbed Study





# Early Vehicle Emissions Program – *Continued*

## The 1955 Los Angeles Riverbed Study

### Summary of Hydrocarbon Emissions

Driving Conditions	Unburned* Hydrocarbons lb/hr		Percent of Fuel Unburned		Air-Fuel Ratio	Fuel Consumption Rate lb/hr
	Model 28	Model 15	Model 28	Model 15		
<b>Idle</b>	0.32	0.16	14.4	6.5	11.9	2.60
<b>Cruise</b>						
20 mph	0.43	0.40	10.8	6.2	13.0	6.17
30 mph	0.42	0.42	9.0	4.7	13.3	8.73
40 mph	0.42	0.45	7.7	3.7	13.6	12.38
50 mph	0.87	0.86	9.4	5.1	13.9	16.58
<b>Acceleration</b>						
0-60 mph – Wide Open Throttle	2.51	1.86	9.5	4.2	12.7	45.60
0-25 mph – Part Throttle (13 seconds)	0.99	0.80	11.4	5.6	13.0	14.42
15-30 mph – Part Throttle (11 seconds)	0.67	0.70	9.2	4.7	13.3	14.87
<b>Deceleration</b>						
50-20 mph – Free Deceleration	0.87	0.54	40.2	21.1	11.9**	2.60
40-20 mph – Heavy Brake (5 seconds)	0.51	0.33	23.8	12.8	11.9	2.60
30-0 mph – Light Brake (11 seconds)	0.49	0.26	21.1	10.3	11.9	2.60
30-15 mph – Light Brake (10 seconds)	0.49	0.30	23.3	1.6	11.9	2.60

\*Model 28 emissions are corrected for instrument response to water and carbon dioxide.

\*\*All deceleration airflow rates and air-fuel ratios were taken as equal to idle.

# The Process Established

- Technology identified
- Stakeholders work together to assess benefits
- International cooperative development
  - Fuel industry
  - Engine/aircraft industries
  - Government agencies
  - Academic/Consulting experts
- Technology deployed

# CRC Member Companies

- FCA
- Daimler
- Ford
- GM
- Honda
- Mitsubishi Motors
- Nissan
- Toyota
- Volkswagen
- Aramco Services
- BP
- Chevron
- Phillips 66
- ExxonMobil
- Marathon Petroleum
- Shell