



Introduction to Aerosol Propellants



About Diversified CPC

We produce the world's purest aerosol propellants and blends to create unique formulas that meet customers' stringent specifications.

For more than 50 years, our engineers has made technological breakthroughs in the aerosol industry.

And we've only just begun.

[Learn more](#)



BASIC PROPELLANT PROPERTIES





Propellants Can Also Act As:



- Solvent
- Diluent
- Viscosity Modifier
- Freezant
- Refrigerant Refill Liquid
- Electronic Duster
- Alarm Agent (boat horn)
- Specialty Degreaser



Properties Conferred to Aerosol Products by Propellants:

- Pressure is created. Normal range is 0.7 to 9.8 bars @ 21.1°C (10 to 142 psig @ 70° F)
- Atomization can be produced. Droplet sizes range from below 1 μm to 125 μm (and higher to include streaming aerosols)
- Improvement in performance. Aerosol insecticides have been reported to be more effective than equivalent pump sprays



Categories of Aerosol Propellants:

Compressed Gases

Soluble Gases

Liquefied Gases

COMPRESSED & SOLUBLE GAS PROPELLANTS





Compressed Gas Propellants

Physical & Chemical Properties:

Properties	Nitrogen (N ₂)	Compressed Air	Carbon Dioxide (CO ₂)	Nitrous Oxide (N ₂ O)
Vapor Pressure (psig 70°F, 21°C) (bar 70°F, 21°C)	N/A ^a	N/A ^a	844.7 (58.2)	759.7 (52.38)
Pressure (psig 130°F, 54°C) (bar 130°F, 54°C)	N/A ^a	N/A ^a	1485 (102.3)	1420 (97.8)
Boiling (°F) (at one atm) (C°)	-320.4 (-195.8)	-317.8 ^b (-194)	-109.2 ^c (-78.4)	-127.4 (-88.5)
Liquid Density (g/ml)	0.00114 ^d (@25°C)	0.00129 ^d (@25°C)	0.713 (@25°C)	0.913 (@25°C)
Specific Gravity Gas Density (Air = 1)	0.967	1.000	1.530	1.530
Water Solubility (vol./vol. at 1.00 atm. abs.)	0.015 (@25°C)	0.018 (@25°C)	0.759 (@25°C)	0.588 (@25°C)

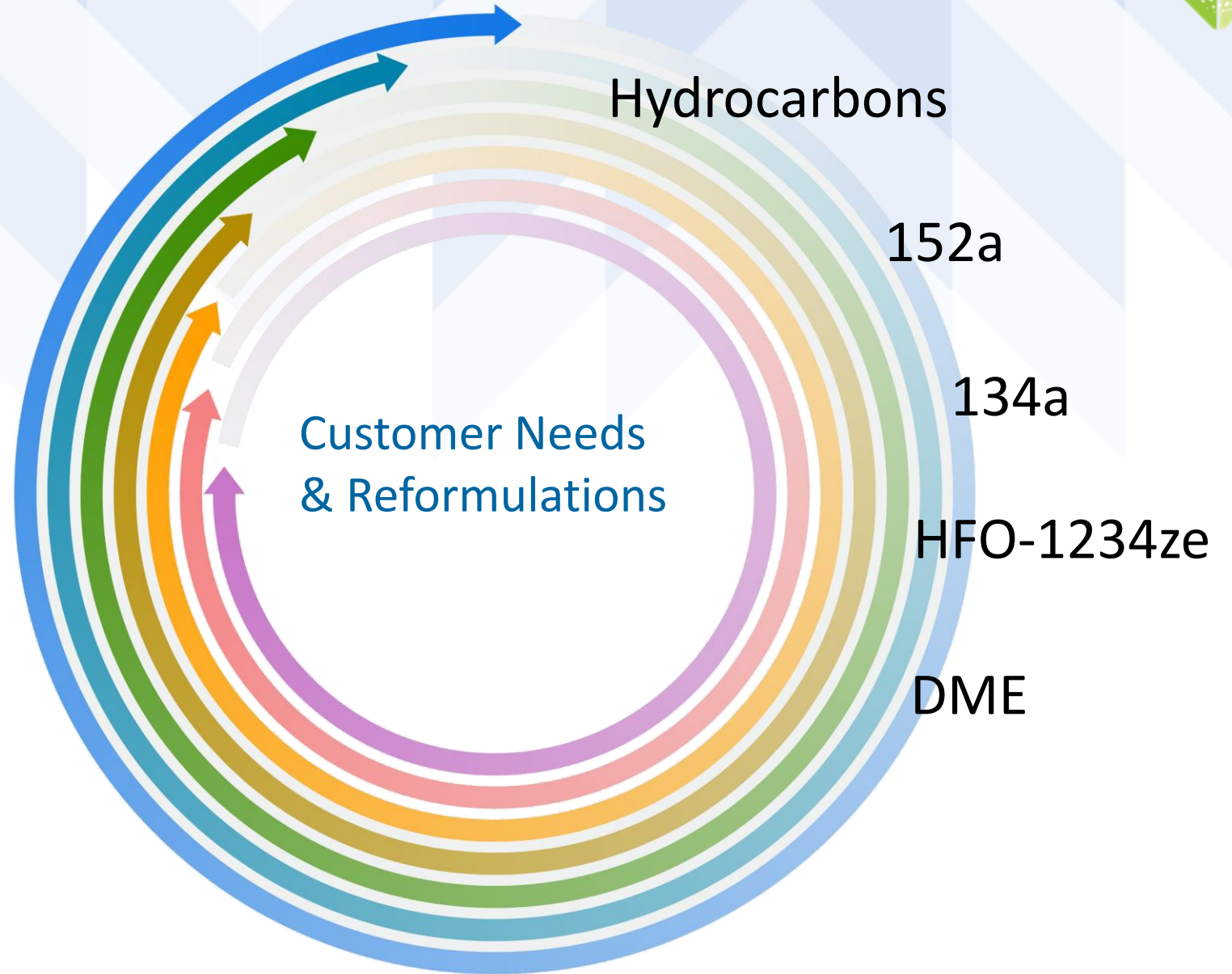
- a. Not Applicable. (Gas cannot be condensed by pressure.)
- b. Initial boiling point of mixture.
- c. Actually, the sublimation point; solid to gas.
- d. The densities for nitrogen and compressed air are for the gaseous phase, since they cannot be liquefied under pressure at these temperatures.

LIQUEFIED GAS PROPELLANTS





Liquefied Gas Propellants:





General Liquefied Gas Propellant Comparisons

	Hydrocarbons	DME	HFCs	HFO (1234ze)
Flammability	Flammable	Flammable	152a is Flammable 134a is Non-Flammable	Non-Flammable
Toxicity	Low (OK for food products)	Low	Low	Low
Solvency	Poor	Good	Poor	Low
Density	Low	Low	Intermediate	Intermediate
Solubility in Water	Low	High	Low	Low
Environmental	VOC	VOC	GWP (134a only)	Low GWP No ODP VOC Exempt (<1)



Vapor Densities of Liquefied Gas Aerosol Propellants (@70°F)

Liquefied Gas Propellant	Vapor (lb./cu.ft)	Liquid (lb./cu.ft)	Vapor/Liquid Ratio	Vapor/Air Ratio
Propane	0.116	28.41	245	1.55
Isobutane	0.154	32.36	210	2.05
N-butane	0.155	33.44	216	2.07
DME	0.119	41.18	346	1.59
Dymel 152a	0.171	56.78	332	2.28
134a	0.264	76.26	289	3.52
HFO-1234ze	0.295 PSIA	74.49	253	3.96
Air @ 70°F	0.075	NA	NA	1.00

Liquefied gas propellants expand substantially from a liquid to a gas when released into the atmosphere. Vapors are heavier than air.



Properties of DME, HFC & HFO Propellants

	DME	HFC-152a	HFC-134a	HFO-1234ze
Chemical Formula	CH_3OCH_3	CH_3CHF_2	$\text{CF}_3\text{CH}_2\text{F}$	$\text{CF}_3\text{CH}=\text{CHF}$
Molecular Weight	46.1	66.0	102.0	114
Boiling Point (°F)	-13.0	-13.0	-15.7	-2.2
Vapor Pressure @70°F (psig)	63.0	63.0	71.0	49
Liquid Density @70°F (g/cc)	0.66	0.91	1.21	1.17g
Flammability in Air LEL	3.3	3.9	NA	NA
Flammability in Air UEL	18.0	16.9	NA	NA
Flash Point (°F)	-42.0	-58.0	None	NA
Kauri-Butanol Value	60	11	10	12
Solubility in Water (wt.% @70°F, autogenous pressure)	35.0	1.7	1.0	.037



Propellant Blends: Vapor Pressure

Low

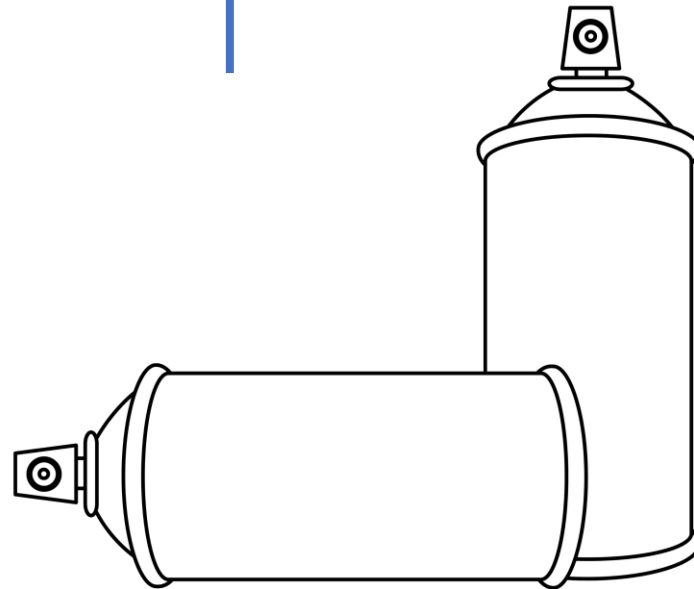
- Shave Cream
- Gels & Mouse
- Oven Cleaner
- Perfume

Medium

- Hard Surface Cleaners
- Furniture Polish
- Deodorant Sprays

High

- Air Fresheners
- Automotive Products
- Flying Insect Spray
- Spray Paint



HYDROCARBON PROPELLANTS





Hydrocarbon Propellants

Organic Compounds

Derived from Natural Gas Liquids (liquefied under pressure)

- Methane: CH_4
- Ethane: C_2H_6
- Propane: C_3H_8
- Butanes: C_4H_{10}
- Pentanes: C_5H_{12}





Properties of the Hydrocarbons

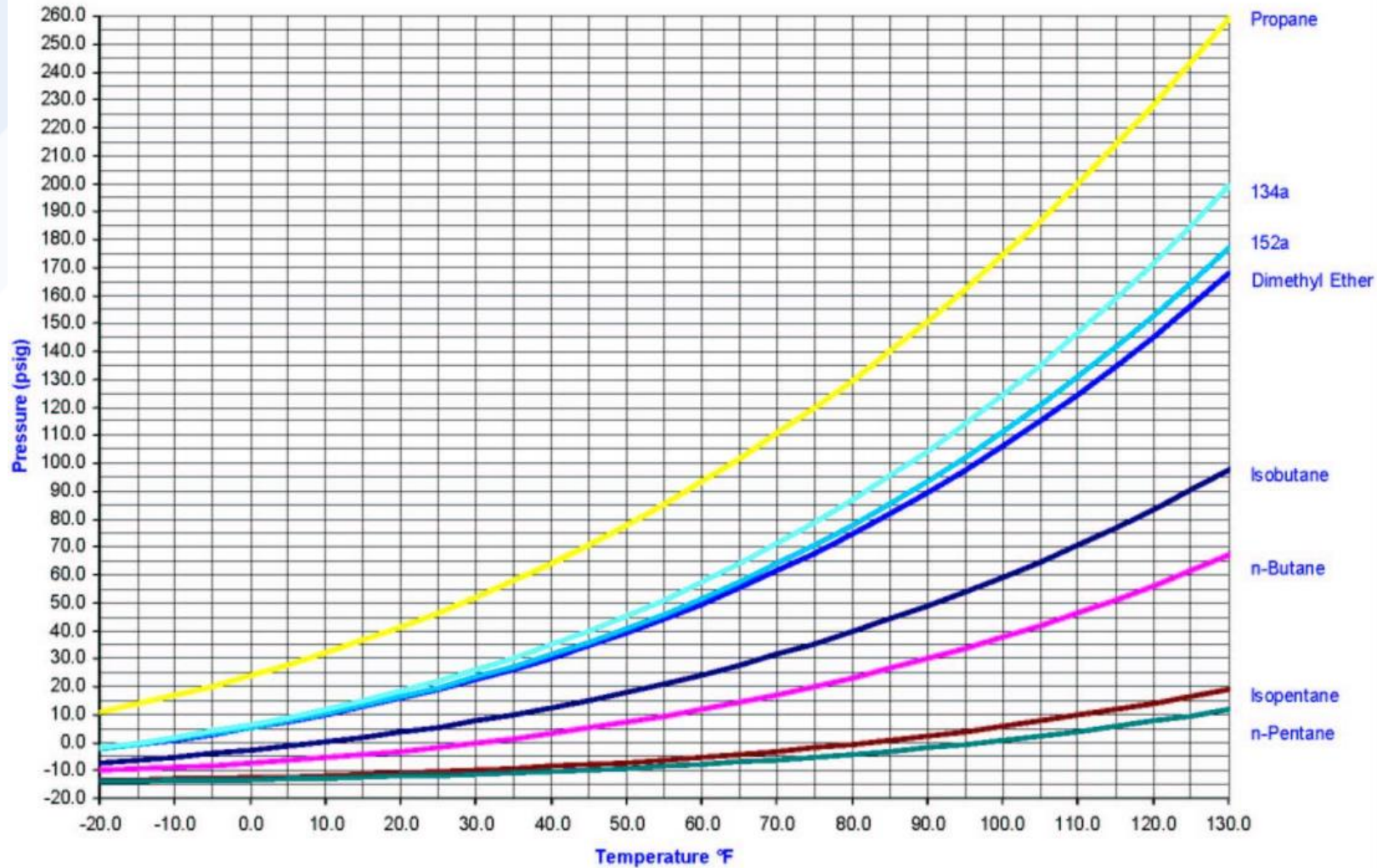
	Propane	I-Butane	N-Butane	I-Pentane	N-Pentane
Chemical Formula	C ₃ H ₈	C ₄ H ₁₀	C ₄ H ₁₀	C ₅ H ₁₂	C ₅ H ₁₂
Molecular Weight	44.1	58.1	58.1	72.2	72.2
Boiling Point (°F)	-43.7	10.9	31.1	82	97
Vapor Pressure @70°F (psig)	109.3	31.1	16.9	-3.1	-6.2
Liquid Density @70°F (g/cc)	0.51	0.56	0.58	0.62	0.63
Flammability in air LEL	2.2	1.8	1.9	1.4	1.5
Flammability in air UEL	9.5	8.4	8.5	7.6	7.8
Flashpoint (°F)	-156	-117	-101	-60	-40
Kauri-Butanol Value	15	18	20	NA	NA
Solubility in Water (wt. % @70°F, autogenous pressure)	0.007	0.008	0.008	---	---



Characteristics of Hydrocarbon Aerosol Propellants

- Low Relative Cost
- Stability & Purity
- Low Odor
- Range of Boiling Points
- Wide Range of Vapor Pressures
- Low Toxicity
- Versatility & Efficiency
- Natural Compounds
- Flammability
- Environmental (VOC)

Vapor Pressure of Liquid Gases



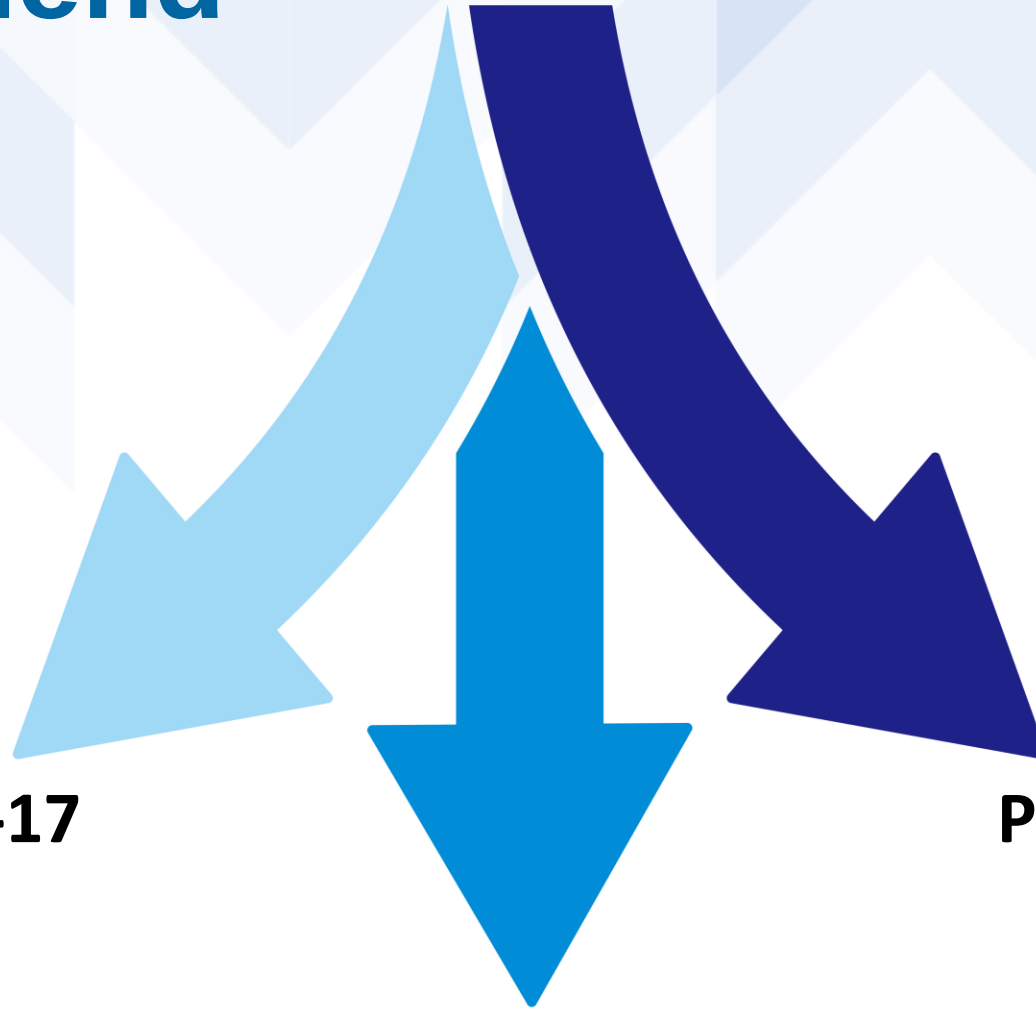
Hydrocarbon Blend Components



N-Butane A-17

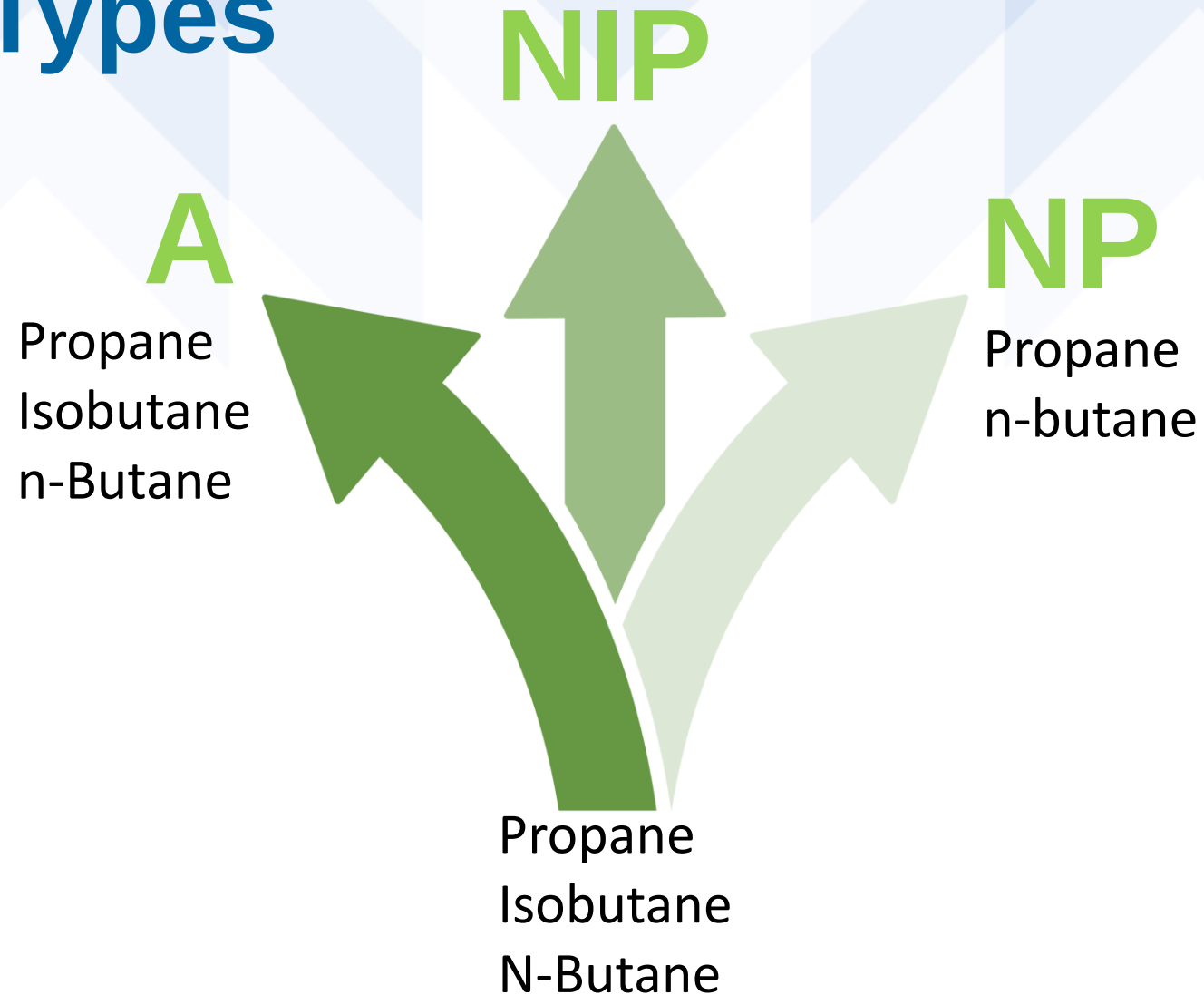
Propane A-108

IsoButane A-31



Standard Hydrocarbon Blends

3 Major Types





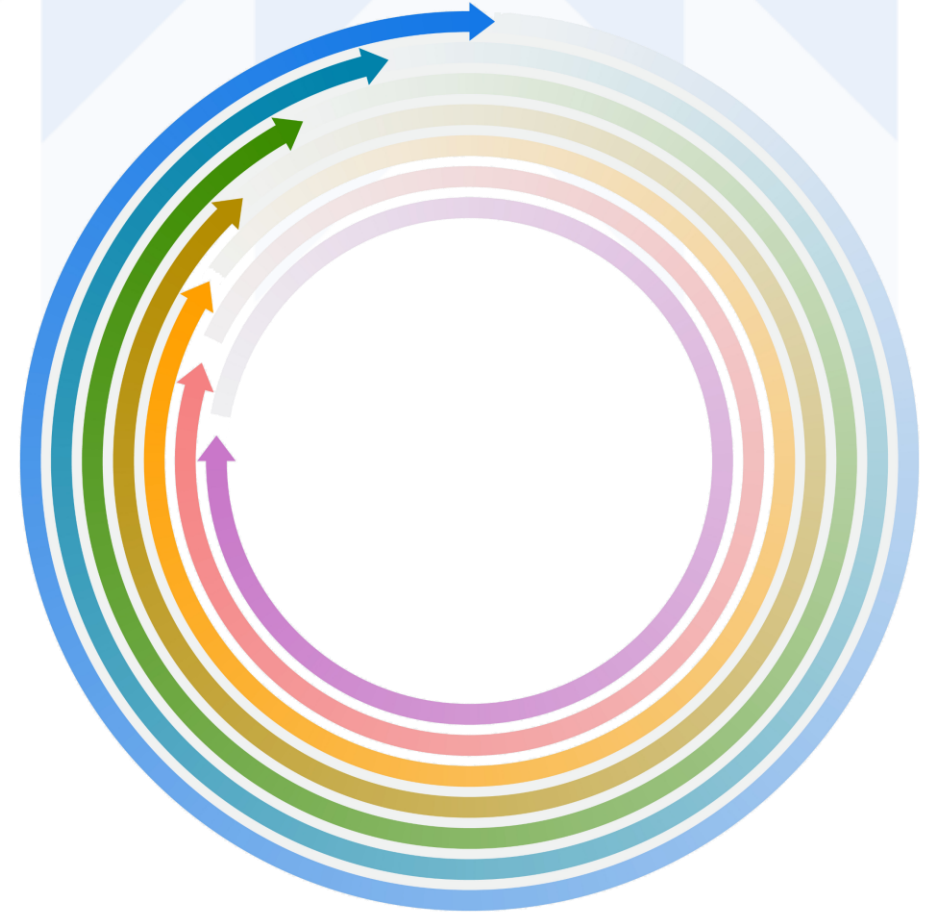
Typical Hydrocarbon Blends

- A-46 (15.2% Propane / 84.8% Isobutane)
- NP-46 (25.9% Propane / 74.1% N-butane)
- NIP-46 (21.9% Propane / 31.3% Isobutane / 46.8% N-Butane)



Typical Hydrocarbon Blends

- A-31
- NP-31
- NIP-31
- A-46
- NP-46
- NIP-46
- A-70
- NP-70
- NIP-70
- A-85
- NP-85
- NIP-108



ABOUT DIVERSIFIED CPC





Our Operations

We produce and delivers the industry's highest purity hydrocarbon propellants through these capabilities:

- ISO 9001 quality production systems to ensure specification compliance
- Proprietary manufacturing processes and equipment:

Fractionation | Hydrogenation Reactor

Molecular Sieves | Intellectual Property

- Extensive storage capacity near our customers
- Dedicated rail car and trucking fleet to maintain purity
- Accredited supply chain processes to help ensure OTD





Our 5-Step Process: Delivering the Power of Purity





- Customer Specifications
- Certificate of Analysis





LOCATIONS



To learn more, visit us.

www.diversifiedcpc.com