



# Introduction to Aerosol Propellants

*The* **POWER**of PURITY™



# 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:

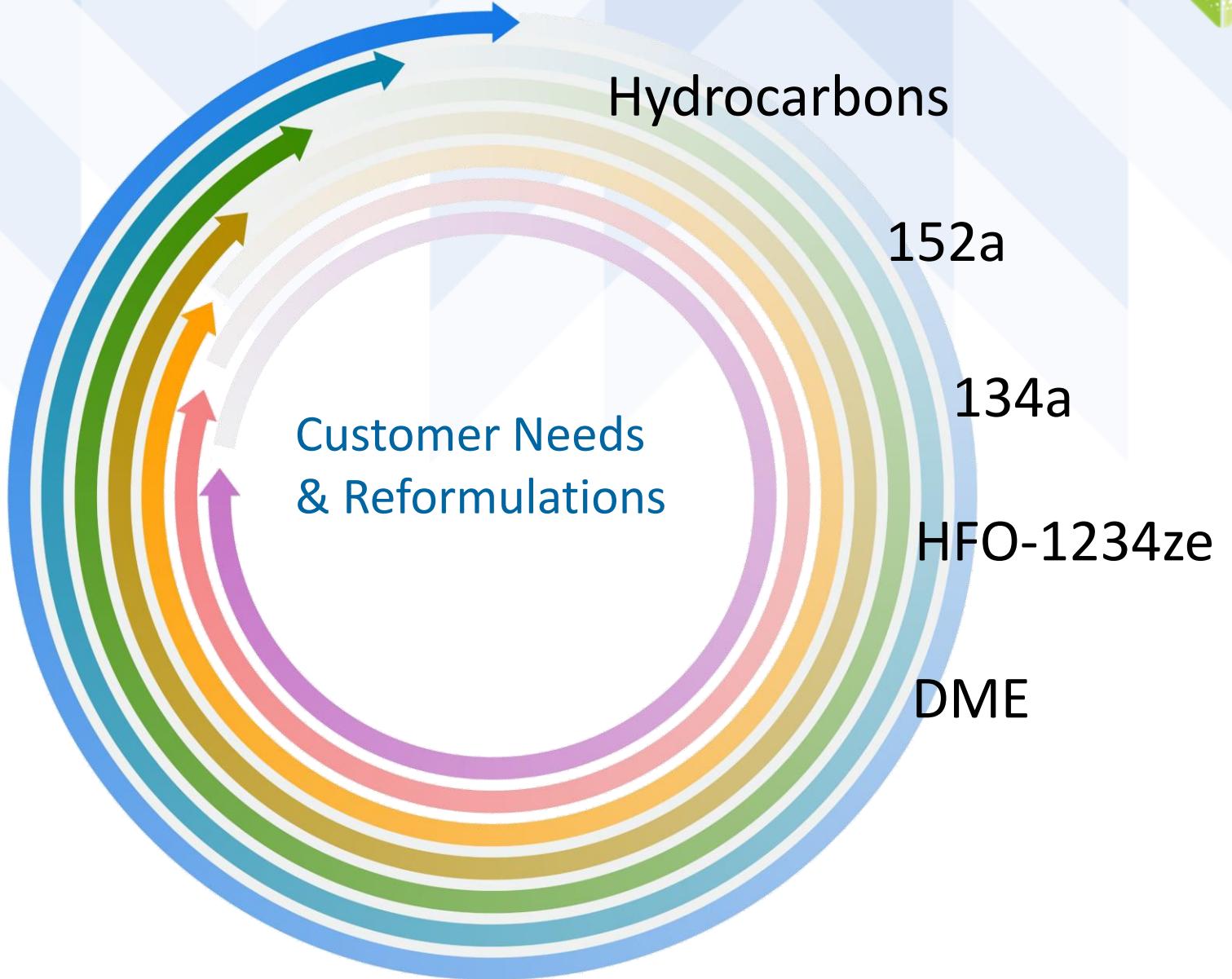
Properties	Nitrogen (N <sub>2</sub> )	Compressed Air	Carbon Dioxide (CO <sub>2</sub> )	Nitrous Oxide (N <sub>2</sub> O)
Vapor Pressure (psig 70°F, 21°C) (bar 70°F, 21°C)	N/A <sup>a</sup>	N/A <sup>a</sup>	844.7 (58.2)	759.7 (52.38)
Pressure (psig 130°F, 54°C) (bar 130°F, 54°C)	N/A <sup>a</sup>	N/A <sup>a</sup>	1485 (102.3)	1420 (97.8)
Boiling (°F) (at one atm) (C°)	-320.4 (-195.8)	-317.8 <sup>b</sup> (-194)	-109.2 <sup>c</sup> (-78.4)	-127.4 (-88.5)
Liquid Density (g/ml)	0.00114 <sup>d</sup> (@25°C)	0.00129 <sup>d</sup> (@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	<chem>CH3OCH3</chem>	<chem>CH3CHF2</chem>	<chem>CF3CH2F</chem>	<chem>CF3CH=CHF</chem>
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

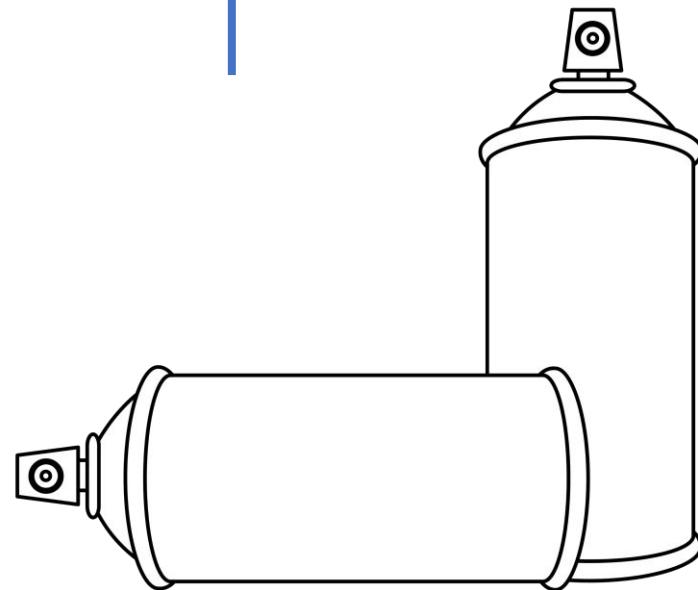
- Shave Cream
- Gels & Mouse
- Oven Cleaner
- Perfume

Medium

- Hard Surface Cleaners
- Furniture Polish
- Deodorant Sprays

High

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



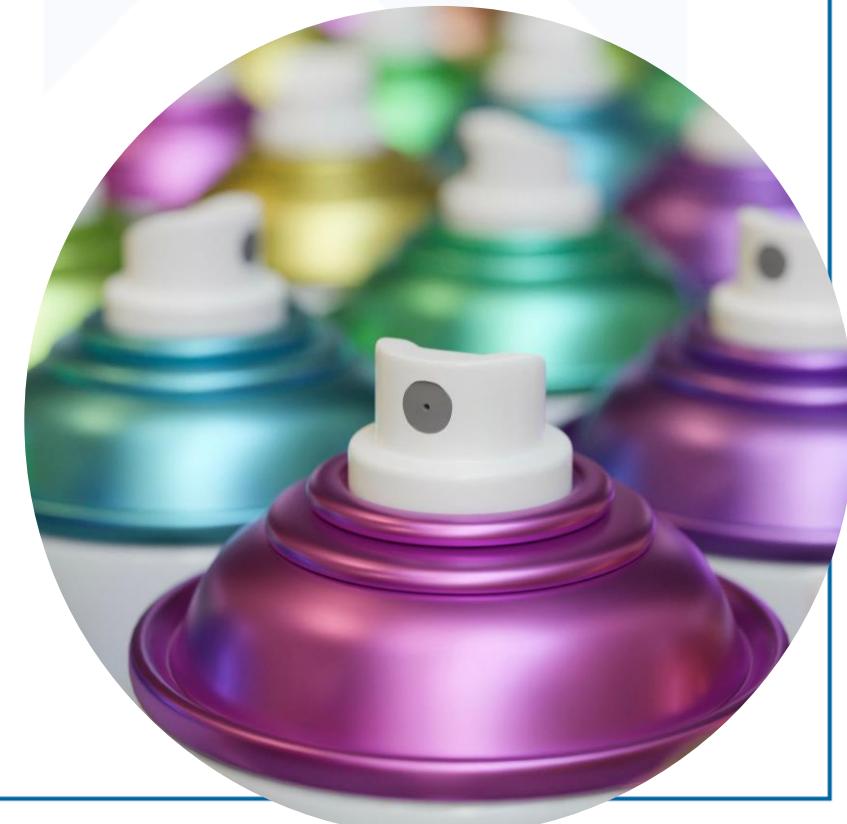
# HYDROCARBON PROPELLANTS



# Hydrocarbon Propellants Organic Compounds

Derived from Natural Gas Liquids (liquefied under pressure)

- Methane:  $\text{CH}_4$
- Ethane:  $\text{C}_2\text{H}_6$
- Propane:  $\text{C}_3\text{H}_8$
- Butanes:  $\text{C}_4\text{H}_{10}$
- Pentanes:  $\text{C}_5\text{H}_{12}$





# Properties of the Hydrocarbons

	Propane	I-Butane	N-Butane	I-Pentane	N-Pentane
Chemical Formula	C <sub>3</sub> H <sub>8</sub>	C <sub>4</sub> H <sub>10</sub>	C <sub>4</sub> H <sub>10</sub>	C <sub>5</sub> H <sub>12</sub>	C <sub>5</sub> H <sub>12</sub>
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	---	---

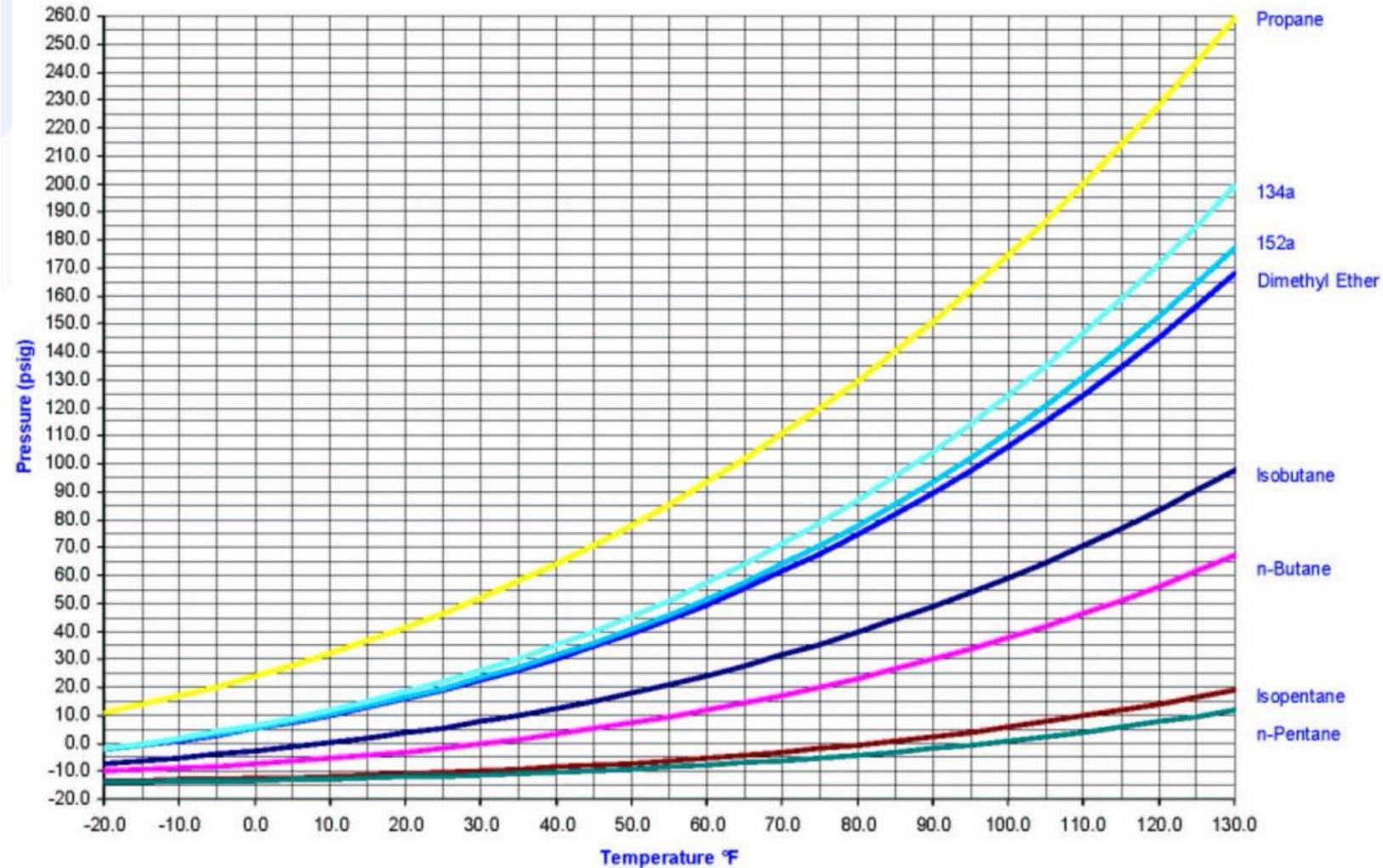


# Characteristics of Hydrocarbon Aerosol Propellants

- 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



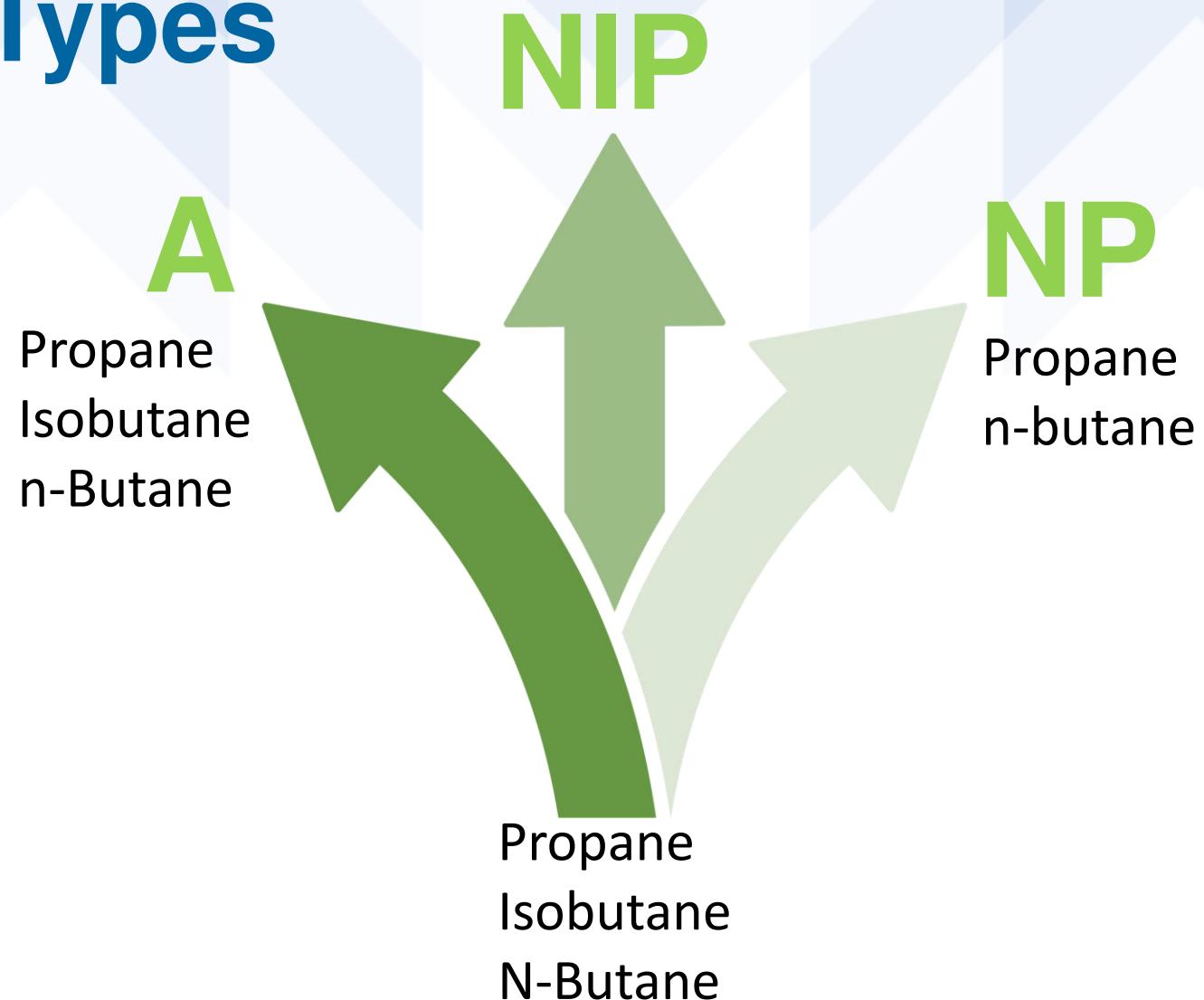
N-Butane A-17

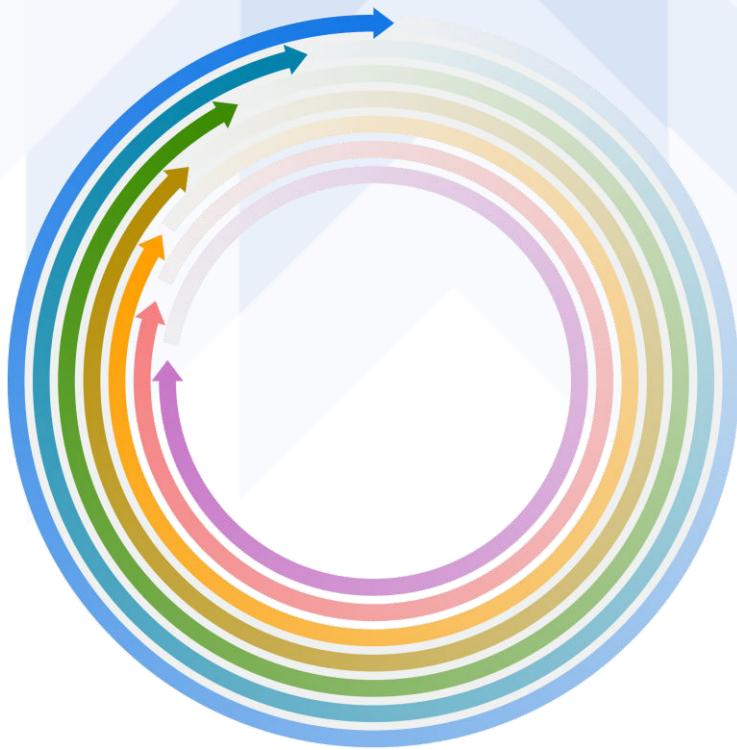
Propane A-108

IsoButane A-31

# Standard Hydrocarbon Blends

## 3 Major Types





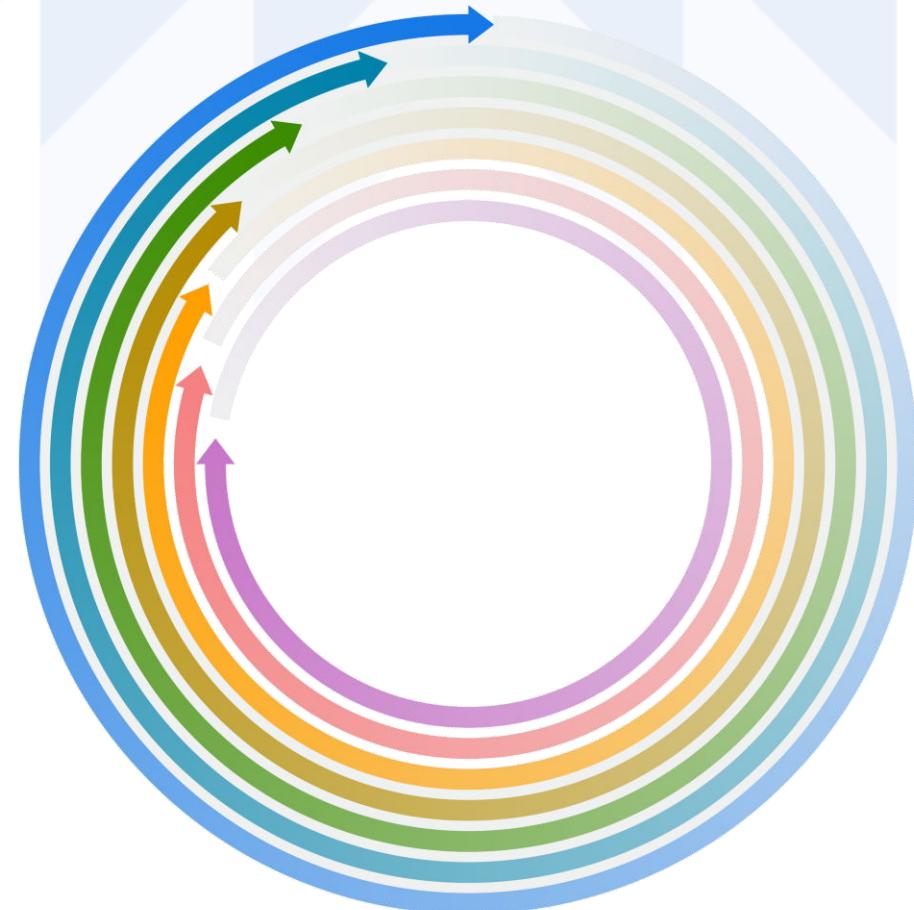
# Typical Hydrocarbon Blends

- 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 deliver 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



### 1 **Collaborate**

with customers  
to develop new  
and improved  
products

### 2 **Produce**

unique solutions  
to meet precise  
customer  
specifications

### 3 **Analyze**

each production  
lot to ensure  
adherence to  
quality  
specifications

### 4 **Certify**

each shipment  
to validate  
product  
compliance and  
authenticity

(Certificate of Analysis)

### 5 **Deliver**

via dedicated fleet  
to protect product  
quality



# VERIFICATION

- Customer Specifications
- Certificate of Analysis

**DiversifiedCPC**  
INTERNATIONAL  
*Pure Innovation with YOU in mind.*

PLANT: Petal, MS

CERTIFICATE OF ANALYSIS

DCPC PRODUCT NAME:  
SOLVENTINE INJECTION  
PETROLEUM GASES, LIQUEFIED

2,1, FLAMMABLE GAS, UN0191  
Hazardous  
HSD CODE: 1  
DATE: 11-02-2021 08:03 AM  
SOURCE: 1  
SAMPLE ID: 1  
DELIVERY DATE: 11/02/2021

COMPONENT  
ETHANE  
PROPANE  
ISOBUTANE  
N-BUTANE

DENSITY  
SPC. GRAVITY  
CALC. PRES.  
ACT. PRES.  
MOISTURE TOTAL

NP-70

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Product Specification  
Version 1 Revision 5

PROPERTY	SPECIFICATION	TYPICAL ANALYSIS	TEST METHOD
COMPOSITION (W/G%)	0.25 Max	<0.05	GAS CHROMATOGRAPHY
ETHANE	48.75 - 52.75%	49.75 - 51.75%	GAS CHROMATOGRAPHY
PROPRANE (Inclusive of Ethane)	2.5% Max	2.0% Max	GAS CHROMATOGRAPHY
ISOBUTANE	47.25 - 51.25%	45.25 - 50.25%	GAS CHROMATOGRAPHY
n-BUTANE (Inclusive of Isobutane)	68 - 72	69 - 71	ASTM D-1257
VAPOR PRESSURE @ 70° F. (PSIG)	1 Max	< 1 ppm	ASTM D-6667
SULFUR (PPM)	5 Max	< 3 ppm	ELECTRONIC
MOISTURE (PPM)	PASS/MATCH STANDARD	PASS/MATCH STANDARD	PANEL
ODOR			

PREPARED

Pure innovation with YOU in mind.  
Safety & Service

Effective Date: June 10, 2021

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Approved by: Lisa Hunger



# LOCATIONS

Anaheim, CA

Channahon, IL  
ISO9001 QMS Certified

Beaumont, TX (NEW)

Headquarters: Joliet, IL

Sparta, NJ  
ISO9001 QMS Certified

Sebring, FL



**To learn more, visit us.**

**[www.diversifiedcpc.com](http://www.diversifiedcpc.com)**